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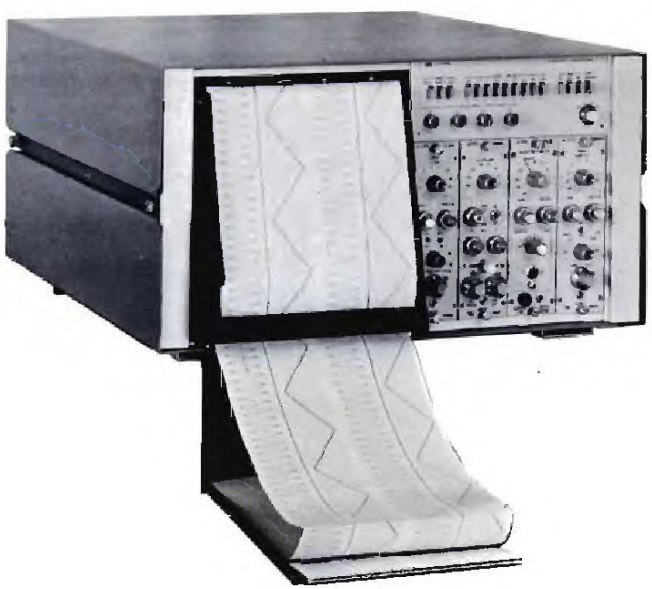
OPERATING AND SERVICE MANUAL

# THERMAL-TIP RECORDER

## 7414A



HEWLETT hp PACKARD

HP-7414A

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# MANUAL CHANGES

MODEL 7414A

THERMAL-TIP RECORDER
(MANUAL TITLE)

MANUAL SERIALS PREFIXED 1145A

MANUAL PRINTED MARCH, 1972

MAKE ALL CHANGES IN THIS MANUAL ACCORDING TO THE ERRATA BELOW. ALSO CHECK THE FOLLOWING TABLE FOR YOUR INSTRUMENT SERIAL PREFIX (FIRST THREE DIGITS OF AN EIGHT DIGIT SERIAL NUMBER) AND MAKE ANY LISTED CHANGE(S) IN THE MANUAL.

| SERIAL PREFIX | MAKE MANUAL CHANGES |
|---|---|
| ALL INSTRUMENTS | ERRATA |
| 1202A | CHANGE 1 |
| 1207A | CHANGE 2 |
| | |

| SERIAL PREFIX | MAKE MANUAL CHANGES |
|---|---|
| | |
| | |
| | |
| | |

## ERRATA

Page 5-4, Paragraph 5-15, Step g: Change reference to Paragraph 5-57 to Paragraph 5-59.

Page 5-5, D, 3, Step c: Change Figure 6-15 reference to Figure 5-4.

Page 5-10, Step a (4): Should read "...by levering from front of top bar..."

Page 5-23, Paragraph 5-47, Step g: Change step to read "Remove snap ring holding sprocket to drive roller shaft using snap ring pliers."

Page 5-25, Figure 5-14: C-ring 0510-1017 shown has been changed to snap-ring 0510-1012, which must be removed with snap-ring pliers.

Page 6-6, Table 6-1: Add on A3MP1, 7124-1605, Label 59-61 (Hz).
Change A3J6, receptacle to 1251-2995, and A3J5 to 9100-3198.

Page 6-12, Table 6-1: Change A9T1 to 07754-60470.
After A10MP5, add attaching part 0510-1012; Ring, retaining.

Page 6-14, Table 6-1: A10A1MP26 was changed in error; see Change 1.

Page 6-16, Table 6-1: Add to Option 008, 7124-1604, Label 49-51 (Hz).



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CHANGE 1: Page 6-14, Table 6-1:
On A10A1MP26, Add 07754-00880 Spring, Solenoid Adjustment;
Delete (1) 07754-00840 Spacer and (3) 07754-00860 Shim.

CHANGE 2: Page 6-13, Table 6-1:
Delete A10W1, Cable, interlock.

Page 6-27, Figure 6-12:
Delete INTERLOCK ASSEMBLY at bottom center of schematic;
Substitute a black jumper across the pins on the Transfer Board A3A1.

0-18937-4
0-18930-6



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| SERIAL PREFIX | MAKE MANUAL CHANGES | SERIAL PREFIX | MAKE MANUAL CHANGES |
|---|---|---|---|
| ALL INSTRUMENTS | ERRATA | | |
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| | | | |
| | | | |

△ NEW OR REVISED ITEM

△ ERRATA

Page 5-22, Figure 5-12: On Speed Control Connections, Pin 3 connects to ORANGE wire and Pin 4 connects to YELLOW wire.

Page 5-28, Figure 5-18: In lower right corner, specification for SHAFT END PLAY of gearbox should be 0.007 inch (0.018 mm).



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# MODEL 7414A THERMAL-TIP RECORDER

**SERIALS PREFIXED: 1145A**

This manual applies directly to HP Model 7414A Thermal Tip Recorders having serial numbers prefixed 1145A.

**OTHER PREFIXES:**

For instruments having prefixes lower than 1145A, refer to Appendix I, Backdating Supplement. For higher prefixes, see the manual change sheets provided.

**OPERATING AND SERVICE MANUAL**
**07414-91999**

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Medical Electronics Division
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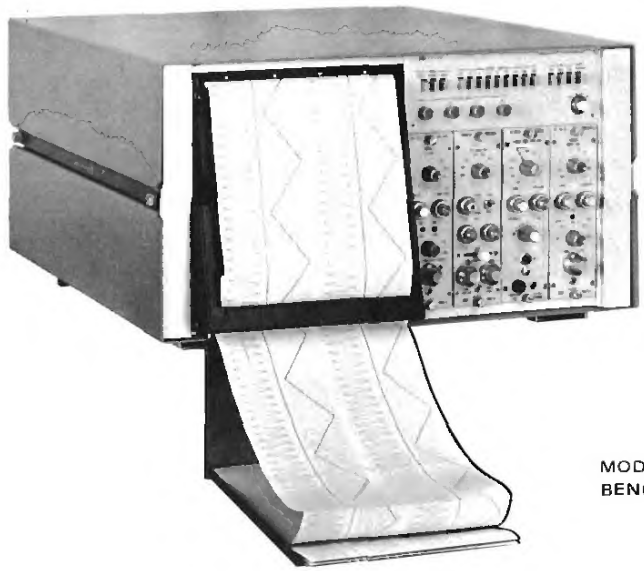
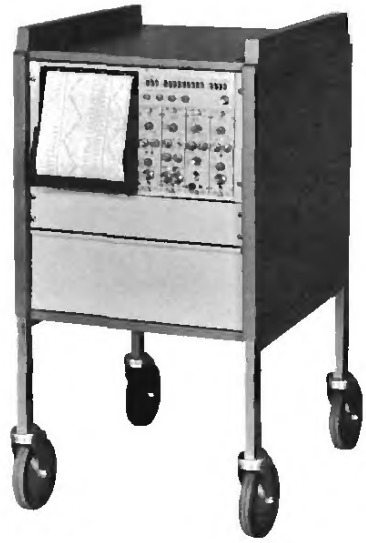


MODEL 7414A RECORDER IN
BENCHTOP ENCLOSURE



MOBILE CART OPTION 054

*Figure 1-1. Model 7414A Recording System and Optional Configurations*



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# SECTION I
# GENERAL INFORMATION

## 1-1. INTRODUCTION.

1-2. This manual contains installation, operating, and maintenance instructions for your Hewlett-Packard Model 7414A Recording System, which has four channels, and produces four recorded traces with heated styli on heat-sensitive chart paper Permapaper.® Other manuals, for use with the 8800-Series Preamplifiers, and for other equipment ordered with the 7414A System are provided separately since a variety of preamplifiers, scopes, tape recorders, computer terminals and control units may be used with the recording system.

## 1-3. FOUR-CHANNEL RECORDER.

1-4. The Model 7414A Recorder (Figure 1-1), at the core of the system, is supplied mounted in a benchtop enclosure. It is optionally available mounted in a mobile cart, or, unenclosed, for mounting in an existing equipment rack.

1-5. The Recorder houses up to four Hewlett-Packard 8800 Series Preamplifiers and supplies them with operating power and signal connections. The preamplifiers, selected for each channel and ordered separately, are installed and tested with the recorder at the factory. It is easy to change the function of any channel by loosening two front panel thumbscrews and replacing the preamplifier with a different model.

1-6. The Model 7414A Recording System records signals monitored from devices, processes, or transducers. To monitor a signal, connect the signal cable to the input connector for the assigned channel on the recorder rear panel. The rear panel inputs are connected to signal conditioning preamplifiers mounted in the recorder. Each preamplifier output is applied to a power amplifier that drives one recording stylus. From the preamplifier output on, all four channels are identical. For ease of maintenance, all electrical adjustments are accessible from the front or top of the recorder, and most assemblies can be removed with the recorder mounted in the enclosure, mobile cart, or equipment rack.

1-7. The recorder uses Z-fold chart paper for convenient access to any part of the recording. The folded paper permits rapid scanning of the record to assess response trends. All pages are numbered to allow insertion in a notebook, or the complete record may be filed in the original flat box (pages are 8 x 12 inches, 20 x 30 cm, approximately). A new pack of chart paper can be loaded quickly, in less than ten seconds, to minimize loss of recording continuity.

1-8. The recorder may be remotely controlled to mark events, start, or go on standby. Two event markers are provided; one permits the user to indicate the start and finish of an event, the second provides time interval marking in minutes or seconds.

### 1-9. Applications and Specifications.

1-10. A wide selection of transducers and Hewlett-Packard preamplifiers are available for research, laboratory, and industrial applications. The following list gives some typical applications where data can be measured, monitored, and recorded using the recorder and Hewlett-Packard preamplifiers:

Engine Testing
Aircraft, Missile, and Space Flight Analysis
Seismographic Studies
Environmental Pollution Monitoring
Telemetry Systems
Production Control
Relative Displacement and Velocity Monitoring

1-11. Hewlett-Packard will be glad to cooperate in the selection of transducers and preamplifiers for any particular measurement, and to send you information as additional instruments are developed to provide your recording system with other capabilities. For help in expanding your system, contact the field engineer at any Hewlett-Packard Sales/Service Office listed in the back of this manual.

1-12. Table 1-1 gives the specifications for the Model 7754A Recorder, a part of the Model 7414A Thermal Tip Recording System, and Table 1-2 lists the recorder options available. Preamplifier specifications will be found in the separate preamplifier manuals. Preamplifier frequency response and rise time must be modified by the frequency response and rise time specifications given for the recorder. Recording quality is improved by the recorder's low level of hysteresis distortion. Minor waveform details are not obscured by recorder-contributed distortion.

### 1-13. 8800 Series Preamplifiers (7414A System).

1-14. The 7414A Recording System is factory assembled for use with the solid-state 8800 Series Preamplifiers (Figure 1-2). They plug in interchangeably from the front of the recorder. Signal connections are made at the rear, but signals can be monitored from the front of the preamplifiers. The general characteristics of each preamplifier are given in the following paragraphs. For complete information see the preamplifier instruction manual.



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*Table 1-1. Model 7414A Recording System Specifications (7754A Recorder)*

**SENSITIVITY:** ±2.5 volts (±0.5 volts) full scale. (Adjustable.)

**FREQUENCY RESPONSE:** Flat within ±0.5 dB (±6%), dc to 50 Hz, reference 50 div. at 10 Hz; down less than 3 dB at 100 Hz, reference 10 div. at 10 Hz.

**POWER RESPONSE:** At 50 Hz: More than 50 divisions (full scale). At 100 Hz: More than 10 divisions.

**CHART SPEEDS:** 0.25, 0.5, 1.0, 2.5, 10, 25, 50, and 100 mm/sec. Speed Regulation: ±1%. Paper Weave: Less than 0.5 mm. (Speeds selected via panel pushbuttons.)

**INPUT IMPEDANCE:** Loading at preamplifier output is 50 kilohms, min.

**NOISE:** Not discernible with recorder input open or shorted.

**GAIN STABILITY:** (One hour warmup). Temperature: 0.25 div/25°C, from 20°C to 40°C. Line Voltage: 0.25 divisions from 103 to 127 vac.

**ZERO DRIFT:** (One hour warmup, input shorted). Temperature: 0.25 div/25°C, from 20°C to 40°C. Line Voltage: 0.25 divisions from 103 to 127 vac.

**OUTPUT LINEARITY:** Error less than ±0.25 divisions at any scale point, including hysteresis (after calibration at center scale and at +20 divisions).

With 8808A Log-Audio Preamplifier, error less than 0.5 division at any scale point, including hysteresis (after calibration for zero error at upper and lower scale ends).

**RISE TIME:** 5 milliseconds over any 20 divisions (10% to 90%), overshoot adjusted for 4% or less.

**LIMITING:** Stylus limit 1.5 mm over channel edge (adjustable).

**MARKERS:** *Event:* Local or remote control (monopolar), located on right side, between channels 3 and 4. *Timed:* 1 minute or 1 second interval (monopolar), located on left side, between channels 1 and 2.

**HYSTERESIS:** Less than ±0.15 divisions (see linearity).

**DAMPING:** Galvanometer damping set to about 4% overshoot.

**CHART PAPER:** Four 40 mm wide channels, each with 50 divisions; time lines every 1 mm; heat sensitive Z-fold Permapaper ® with green grid lines is available in packs of 500 sheets, each sheet 12 inches (30 cm) long, and numbered for footage and indexing.

Green grid lines and black stylus trace make recording suitable for reproduction.

**PAPER LOADING:** No threading required. Loading in 10 seconds.

**PAPER TAKEUP:** On shelf of recorder, or in drawer provided with cart installations.

**TRACE WIDTH:** 0.020 inches (0.5 mm) nominal; depends upon heat control setting.

**REMOTE OPERATION:** Rear panel connector J8. Remote operation of chart drive, event marker, optional extra marker. Connector also supplies ±12, ±20, and -24 vdc.

**FRONT PANEL CONTROLS:** Power, Chart Drive, Chart Speed selection, Time Marker, Event Marker, Channel Heat controls.

**OTHER CONTROLS:** Each Channel: Position, Gain, Damping, High Limit, Low Limit, 440 Hz Oscillator Amplitude.

**POWER REQUIRED:** 115/230 volts ac, (±10%), 60 Hz (50 Hz optional), 300 watts. Warmup time, approximately 15 seconds.

**DIMENSIONS:** Height: 10.5 inches (29 cm). Width: 19.0 inches (48.3 cm), for standard rack. Depth: 22.75 inches (57.3 cm). Projection: 2.5 inches (6.3 cm) from rack front.

**Bench Top Enclosure:** Height: 11.87 inches (30.2 cm). Width: 20.25 inches (51 cm). Depth: 24 inches (60.5 cm). Paper Takeup Tray projects 10.5 inches (26.4 cm) from front; hangs down 5.5 inches (13.8 cm).

**Mobile Cart (Option 054):** Height: 41 inches (105 cm). Width: 23 inches (59 cm). Depth: 31 inches (79 cm).

**WEIGHT:** Recorder: 76 lbs (34.4 kg). Bench Top Enclosure: 94 lbs (42.5 kg); with paper takeup shelf 95.5 lbs (43.3 kg); with Mobile Cart: 191 lbs (81 kg).

**ENVIRONMENT:** Maximum ambient temperature (free air circulation): 40°C (104°F). No free air circulation: 25°C (77°F). Location: Free from dust, explosive vapors, corrosive vapors, and extreme cold.



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*Table 1-2. Model 7414A Recording System, Equipment Options*

| Option | Part Number | Description |
|---|---|---|
| | 7414A | Four Channel Thermal Tip Recording System, 60 Hz, 115/230V ac; mint gray front panels, jade green knobs, 440 Hz Oscillator for 8803A High Gain Preamplifier, and 2400 Hz Oscillator for 8805A Carrier Preamplifier; moss gray Bench Top Enclosure 07754-60261. |
| 001 | 07754-60600 | Rack mounting kit (Figure 2-7), with paper take-up tray and panel. |
| 008 | | For 115/230V ac, 50 Hz operation. |
| 012 | | Less one channel; right channel No. 4 is deleted, event marker installed between channels 2 and 3, extra marker cannot be installed with this option. |
| 015 | 07754-60350 | Extra monopolar marker installed between channels 2 and 3; this marker cannot be installed with Option 012. |
| 054 | | Mounted in 1064B Mobile Cart; moss gray, with paper take-up drawer, blank panel. |

Note: For a complete System, order up to four 8800 Series Preamplifiers.

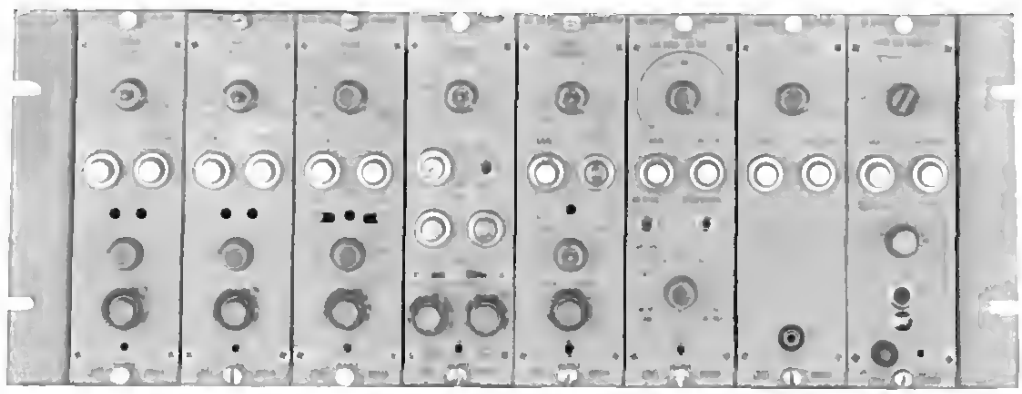

*Figure 1-2. 8800 Series Preamplifiers*



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1-15. MODEL 8801A LOW GAIN DC PREAMPLIFIER. – With a maximum sensitivity of 5 mV/div, the 8801A provides stable and precise amplification from dc to the limit of the recorder's capability, or up to 10 kHz when used with an oscilloscope or other indicator. The 8801A features calibrated zero suppression with limits of ±10 and ±100 volts.

1-16. MODEL 8802A MEDIUM GAIN DC PREAMPLIFIER. – The 8802A has a gain that is five times greater than the 8801A and zero suppression to ±2 and ±20 volts. Except for the common-mode tolerance, which is smaller by a factor of five on the high sensitivity positions of the RANGE control, the choice between the 8801A and 8802A depends directly on signal input requirements.

1-17. MODEL 8803A LOW LEVEL PREAMPLIFIER. – With a maximum sensitivity of 1 $\mu$V/div, corresponding to a gain of 100,000, the 8803A accommodates a much wider range of signal amplitude (within a bandwidth of dc to 100 Hz) than the 8801A and 8802A. The 8803A features a fully-guarded input circuit, with a floating input and common-mode rejection as high as 160 dB at dc (120 dB at 60 Hz). In addition to a high rejection ratio, the input circuit will tolerate a common-mode voltage as high as ±300 Vdc at any position of the RANGE control. Calibrated zero suppression is provided in three maximum ranges: ±1, ±10, and ±100 volts with resolution to $10^{-3}$.

1-18. MODELS 8805A/B CARRIER AMPLIFIER. – The 8805s measure any physical variable that can be coupled to a suitable transducer, *i.e.*, strain gage bridge, resistance or reactance transducer, or differential transformer. A partial listing of physical variables includes: strain, pressure, force, velocity, flow and acceleration. A 2400 Hz oscillator in the recording system provides an excitation voltage which is amplified by a buffer amplifier in the 8805 to a power level appropriate for exciting the external transducer, eliminating the need for an external excitation circuit. The excitation voltage, 5 Vrms at 2400 Hz, can drive a load resistance greater than 100 ohms; the amplifier will operate with sources having an internal impedance up to 5000 ohms at the signal input terminals. Calibrated zero suppression permits analyzing small signals when large static loads are present on the transducer. A calibration factor control allows attenuation and zero suppression to be calibrated in terms of transducer load units.

1-19. MODEL 8806B PHASE-SENSITIVE DEMODULATOR. – The 8806B provides a dc output proportional to the rms value of an input signal component that is in phase, or 180° out of phase with respect to an external ac reference voltage. For flexibility, the phase-reference voltage can be shifted to any phase angle by three plug-in calibrated phase shifters, available for frequencies of 60, 400, or 5000 Hz. A fourth plug-in phase shifter covers six frequency bands from 50 Hz to 40 kHz and provides for continuous phase shifting from 0° to 360°. Other features include transformer isolation for both the signal and reference voltage circuits, and a maximum calibrated sensitivity of 0.5 mV rms/div, corresponding to a gain of 200 (rms ac to dc).

1-20. MODEL 8807A AC TO DC CONVERTER. – The 8807A provides a dc voltage output proportional to the average value of a full-wave rectified ac input signal. Range sensitivity is calibrated in terms of rms, for sinusoidal waveforms. The input circuit is transformer coupled, floating, and guarded for high common-mode rejection, allowing measurements over a wide range of input signal conditions: 3 mV to 500 Vrms, from 50 Hz to 100 kHz. Calibrated zero suppression and variable scale expansion permit clear analysis of small excursions in large input signals.

1-21. MODEL 8808A LOG LEVEL PREAMPLIFIER. – The 8808A contains compression and full-wave detection circuits that provide an output proportional to the $\log_{10}$ of the ac input signal amplitude, expressed in decibels, where zero decibels is taken as a 1 volt rms sine-wave input voltage. The unit provides for 50 dB and 100 dB ranges, with full-span outputs corresponding to ±2.5 volts or 0 to +5 volts. Input signals from 3 mv to 300 Vrms may be recorded without changing ranges; a voltage ratio of 100,000 (100 dB).

1-22. MODEL 8809A SIGNAL COUPLER. – The 8809A is a low cost, solid state preamplifier with selectable high or low input impedance and a GAIN control. It is used for simple signal coupling to an HP direct writing recorder, in single and multichannel systems.

### 1-23. Accessories.

1-24. For a list of recorder accessories, refer to Table 6-1, Assembly A19, Accessories. Order accessories by their individual part numbers. For other system accessories, refer to the separate equipment manuals provided with the recording system.



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# SECTION II
# INSTALLATION

## 2-1. INITIAL INSPECTION.

2-2. Initial inspection consists of a check for physical damage incurred during shipping, and the completion of all performance tests. See Figure 2-1 for Recorder inspection particulars.

### 2-3. Mechanical Check.

2-4. If damage to the shipping carton is evident, notify the HP Sales/Service Office and unpack the equipment in the presence of the carrier's agent. Upon unpacking, inspect the instrument for mechanical damage such as scratches, dents, broken knobs, or other defects. Also check the cushioning materials for signs of severe stress during handling.

### 2-5. Performance Tests.

2-6. The electrical and mechanical performance of the Model 7414A Thermal Tip Recording System may be verified upon receipt, using performance tests described in Section V, Maintenance. An 8800-Series Preamplifier must be in place for these tests.

### 2-7. Damage Claims.

2-8. If the instrument is damaged in transit, notify the carrier and the nearest Hewlett-Packard Sales/Service Office immediately. For your convenience, a list of these offices is located in the rear of this manual. Keep the shipping carton and packaging material for the carrier's inspection. The Sales/Service Office will arrange for repair or replacement of the System without waiting for claim settlements from the carrier.

## 2-9. STORAGE.

2-10. If the Recording System is to be stored for a period of time, wrap the front panels in protective padding and seal the equipment in a moisture-proof covering. Repackage the System in a container similar to the original factory carton. If the System is installed in a Bench Top Enclosure, leave it mounted in the enclosure. If it is installed in a Mobile Cart or equipment rack, remove it from the cart or rack to facilitate moistureproof packaging. If long-term storage is anticipated, pull the paper table out at the Cart drawer and unlatch it. This will prevent a flat spot from developing on the drive roller from the spring-loaded pressure roller.

## 2-11. INSTALLATION.

2-12. Recording Systems installed in the Bench Top Enclosure do not require installation instructions. For access to the Recorder, loosen knobs at the front of the case and raise the top cover (see Figure 2-1). If the Recorder is installed in a Mobile Cart, release the four front-panel shipping screws to slide the Recorder out for receiving inspection and performance checks (see Figure 2-1). If the Recorder is installed in an existing equipment rack, the rack slides must be installed before mounting the Recorder (Option 001).

### 2-13. Preamplifier Installation.

2-14. The Recording System is shipped with all preamplifiers installed. To change a preamplifier, perform the following steps.

a. Switch off Recorder power.

b. Loosen the top and bottom front panel screws and pull the preamplifier straight out.

c. Insert the replacement preamplifier into the channel guide, push firmly to mate connectors, and tighten screws at the top and bottom of the front panel.

### 2-15. Power Connections.

2-16. Check that the power line voltage and frequency is the same as that shown on the Recorder nameplate, located on a shelf at the left side of the rear panel (see Figure 2-2). Note locations of the fuses.

2-17. When making power connections, push the POWER button on the front panel so that it protrudes and a Z-shaped line appears. Otherwise, the recorder will start when the power cord is plugged in. Refer to Figure 2-3 and perform the following steps for Mobile Cart power connections.

a. Connect a ground wire (as shown) to a good earth ground, such as a cold water pipe.

b. Check that the paper take-up drawer is grounded with a strap, and that the recorder chassis is grounded to the cart.

c. Plug the power cord connector into the recorder POWER INPUT jack, and into the line receptacle built into the cart.

d. Connect the cart power cord to a 3-wire line outlet, completing the power connections.



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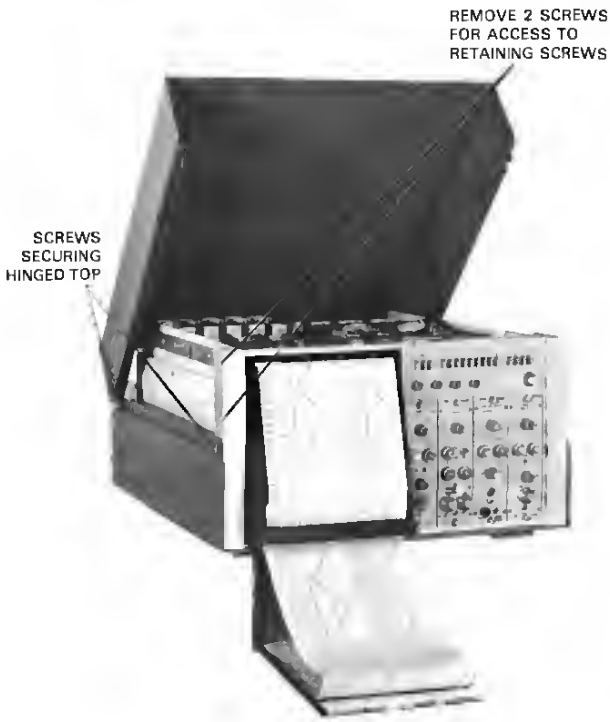
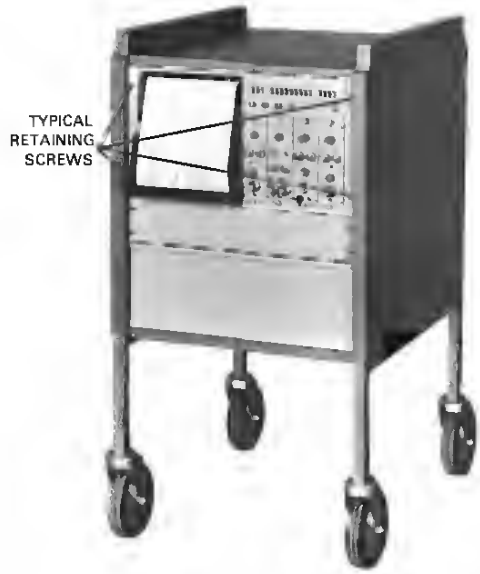
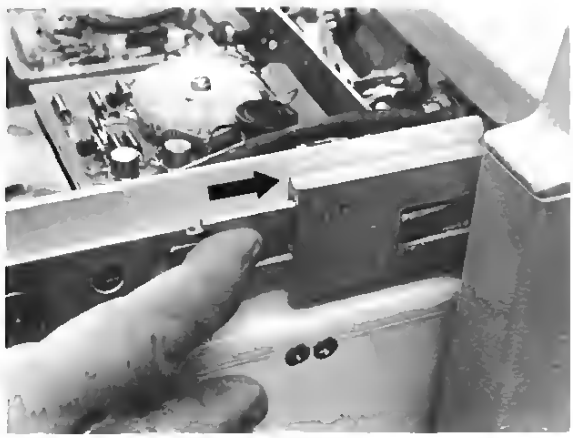
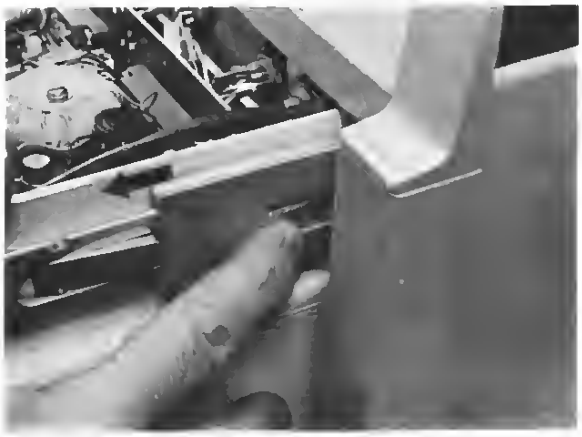



**WARNING: DO NDT ACTUATE REAR SLIDE LOCKS UNLESS RECORDER IS SUPPDRTED FDR REMDVAL.**



Press front slide locks to slide recorder back into cart or cabinet.



Press rear slide locks to slide recorder completely out of retaining slides.

*Figure 2-1. Recorder Access for Receiving Inspection*



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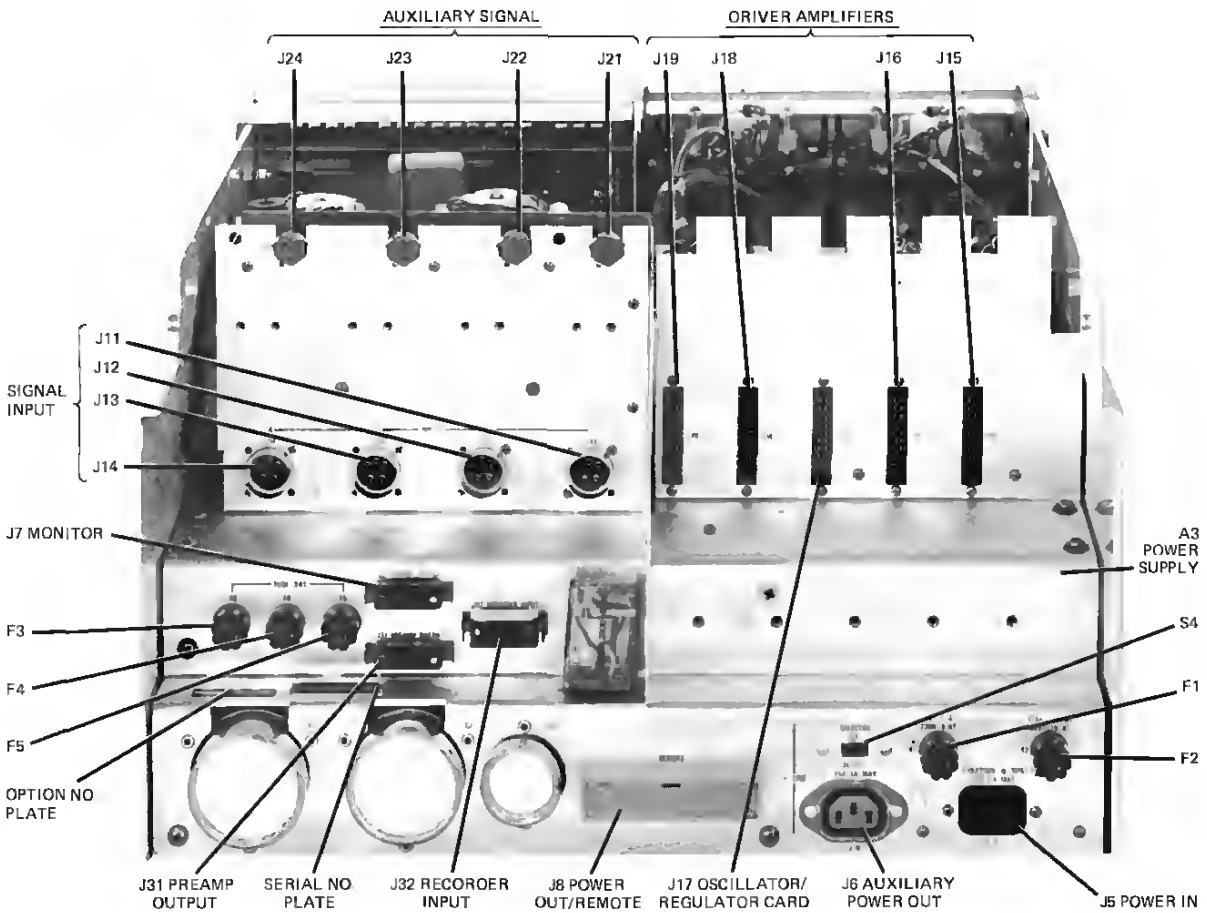


FUSE COMPLEMENT

| Reference Designator | Service | Value and Type |
|---|---|---|
| F1 | AC Power, 115V Service | 6A |
| | AC Power, 230V Service | 3AT |
| F2 | Recorder, 115V Service | 2.5AT |
| | Recorder, 230V Service | 1.25AT |
| F3 | +20V dc | 3AT |
| F4 | −20V dc | 3AT |
| F5 | −24V dc | 3AT |
| F6 (not shown) | 2400 Hz Oscillator (Option 004) −20V dc supply — See Figure 6-7. | 100mAT |

*Figure 2-2. Recorder Rear Panel Connections and Fuse Locations*



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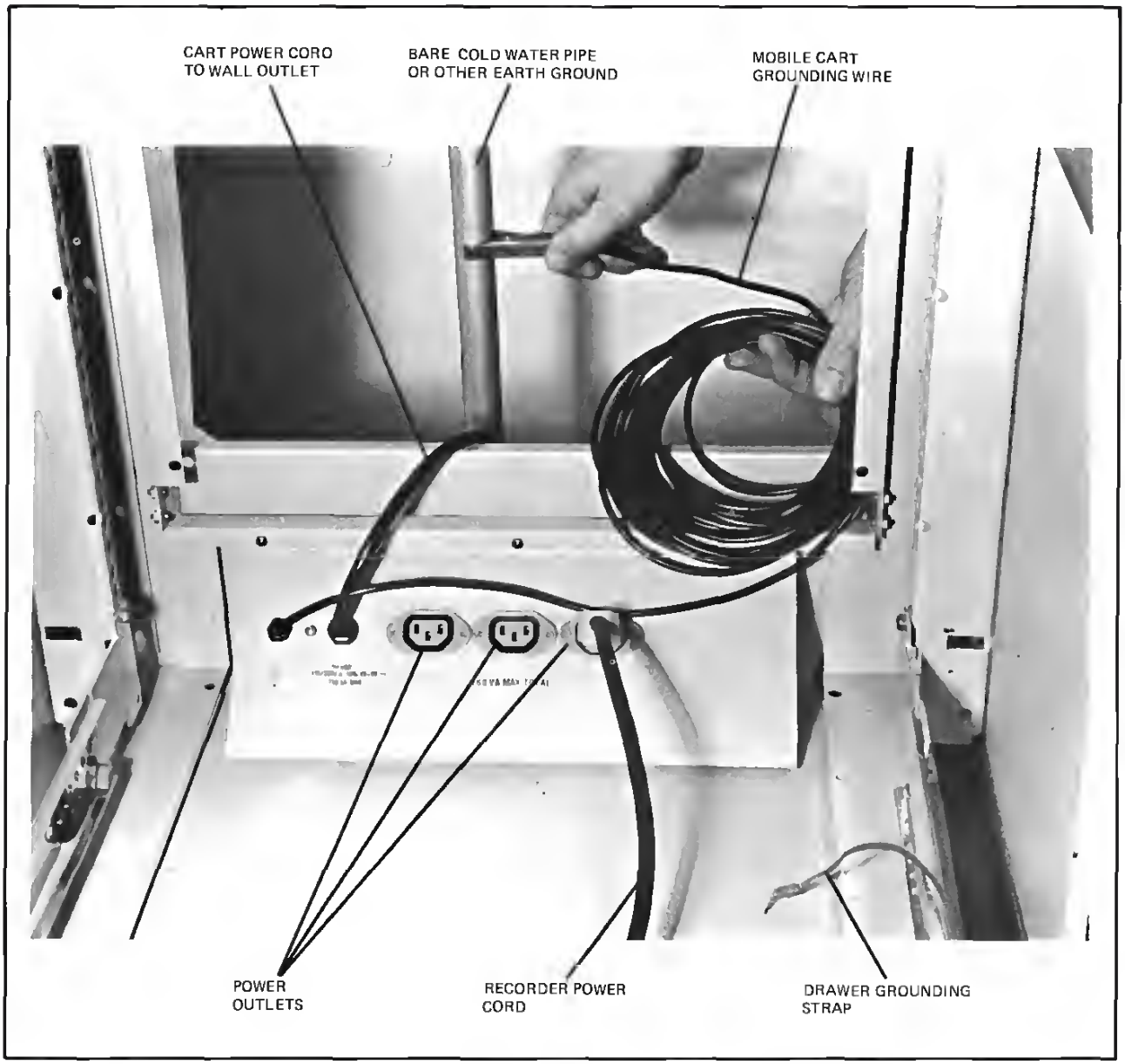
CART POWER CORD TO WALL OUTLET
BARE COLD WATER PIPE OR OTHER EARTH GROUND
MOBILE CART GROUNDING WIRE
POWER OUTLETS
RECORDER POWER CORD
DRAWER GROUNDING STRAP

*Figure 2-3. Recorder and Mobile Cart Power Connections*

**2-18. Signal Connections.**

2-19. For signal connection information relative to the individual preamplifiers, refer to the preamplifier instruction manuals. Also refer to Figure 2-4 for a description of signal cable preparation for the 8800-Series Preamplifiers.

**2-20. Tape System Connections.**

2-21. If an instrumentation tape recorder is to be used with the Recording System, the addition of a 4681A or a 4682A Control Section is recommended. Connections for the Recorder and the Control Sections are shown in Figure 2-5.

**2-22. Remote Control and Marker Connections.**

2-23. A remote control and marker plug is supplied with the Recorder as an accessory. To make remote control connections for operating the Recorder and the Event Marker, make the cable connections shown in Figure 2-6, using the HP parts noted in the illustration.



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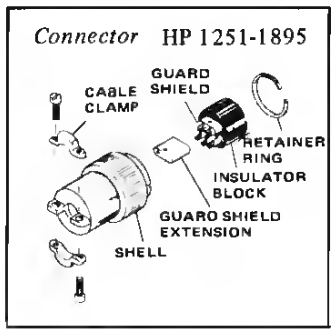
## SIGNAL CONNECTOR PREPARATION

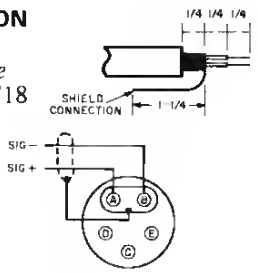
a. Slide the prepared end of the cable into the cable clamp and through the connector shell. Also slide the end of the cable through the guard shield extension, for guarded input circuits. For non-guarded input circuits, remove and store the guard shield extension.
b. Wire the connector according to the diagram below, according to preamplifier to be used. For guarded input circuits, slide the guard shield extension into place after soldering the signal leads to terminals A and B.
c. Press the connector block carefully into the connector shell.
d. Insert the retaining ring.
e. Tighten the cable screws.
f. Check with an ohmmeter to determine that the cable shields are not shorted to the connector shell or to each other.



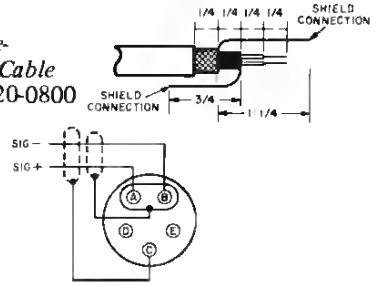

## GUARDED CABLE PREPARATION

| PREAMPLIFIER MODEL |
|---|
| 8803A |
| 8806B * |
| 8807A ** |

*Single-Shield Cable* HP 8120-0718




*Double-Shield Cable* HP 8120-0800




**NOTES:**

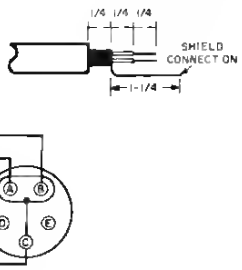
* 1. Connect Ref voltage to pins A and B on auxiliary connector of the power supply.

** 1. AC output available on pin C of auxiliary connector of the power supply.
2. DC input (8807A, Opt 02) available on pins A and B of auxiliary connector of the power supply.

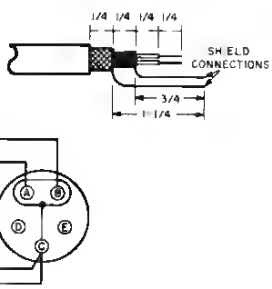
## NON-GUARDED CABLE PREPARATION

| PREAMPLIFIER MODEL |
|---|
| 8801A |
| BB02A |
| 880BA |
| 8B09A |

*Single-Shield Cable* HP 8120-0718




*Double-Shield Cable* HP 8120-0800




**NOTE:**

Single conductor shielded cable can be used by connecting center conductor to pin A and shield to pin B.

## CARRIER PREAMPLIFIER CABLE PREPARATION

| PREAMPLIFIER MODEL |
|---|
| 8805A |
| 8B05B |

HP Transducers having 5-pin AN connectors (pin pattern ⋮ ) use Input Adapter 14060B for signal input connactions. For other signal sources, connect the input signals as shown. Tha transducer output leads and transducer excitation leads must be twisted and enclosed in braided shielding.

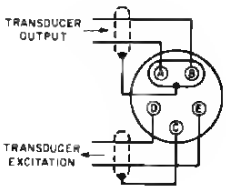



*Figure 2-4. 7414A System Input Cable Preparation*



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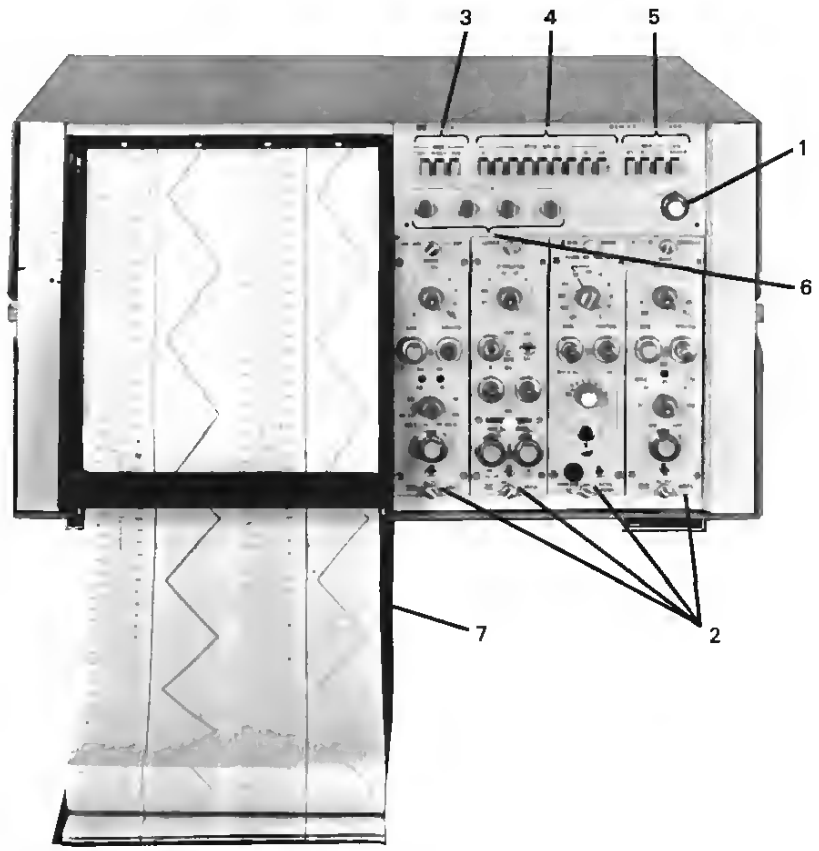


1. RECORDER POWER SWITCH: Press to apply power; press to remove power. Back-lighted with power applied.

2. 8800-SERIES PREAMPLIFIERS: Refer to the individual instruction manuals for control information.

3. MODE CONTROL BUTTONS: Pressing the STDBY button holds the styli of all channels at chart center during Recorder operation. The REMOTE button transfers control of the Recorder "run mode" to a remote location. The RUN button starts the chart drive, applies heat to the styli and signals to the recording circuits.

4. SPEED MM/SEC CONTROL BUTTONS: Nine speed selection buttons select standard chart speeds from 0.25 to 100 mm/second. Button remains depressed to indicate selected chart speed.

5. TIMER BUTTONS: The OFF button turns off the interval timing marker. The SEC button selects timing marks at 1-second intervals. The MIN button selects timing marks at 1-minute intervals. The EVENT MARKER button applies a marker pulse when pressed, to mark events in the process being recorded.

6. STYLUS HEAT CONTROLS: Individual controls adjust the heat at each stylus tip, and thereby the trace width. More stylus heat is generally required for high-frequency signals than low-frequency signals. Once adjusted, stylus heat is automatically regulated to compensate for changes in chart paper speed.

7. PAPER TAKEUP DRAWER (CART): The takeup drawer pulls out to receive used chart paper. For Bench Top Enclosure models, a paper takeup shelf is provided. Install as shown in Figure 3-2.

*Figure 3-1. 7414A Recording System, Control Locations*



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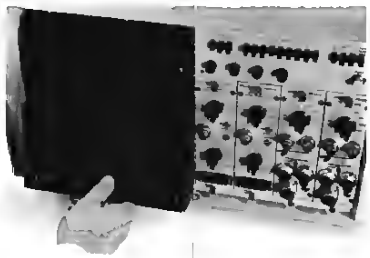
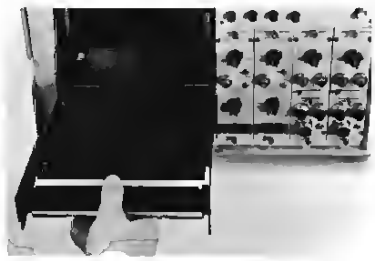
1 UNWRAP PAPER and remove cardboard. Make sure highest odd number is on top of pack.

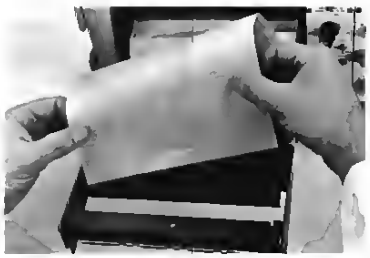


2 PULL PAPER TABLE OUT AT BOTTOM.



3 LOWER IT SLOWLY. It must be fully horizontal.

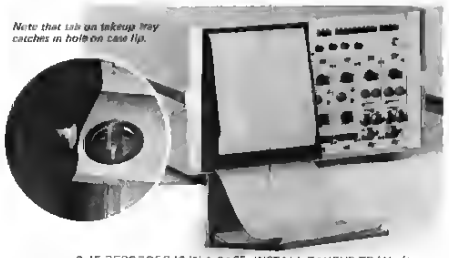
4 SLIDE PAPER PACK INTO FEED TRAY while compressing paper and pulling top sheet out.



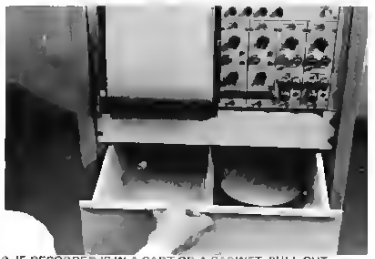
5 INSERT PAPER INTO PAPER TABLE SLOT.

6 CLOSE PAPER TABLE, pulling down slightly on paper. Press table in firmly so it locks in place.

7 PAPER MUST NOT BE SLACK. A slight looseness as shown is all right.




8 IF RECORDER IS IN A CASE, INSTALL TAKEUP TRAY. Note that an odd numbered sheet should be first onto tray.



9 IF RECORDER IS IN A CART OR A CABINET, PULL OUT PAPER TAKEUP DRAWER. Odd-numbered sheet should be first into drawer.

*Figure 3-2 Paper Loading Procedure*



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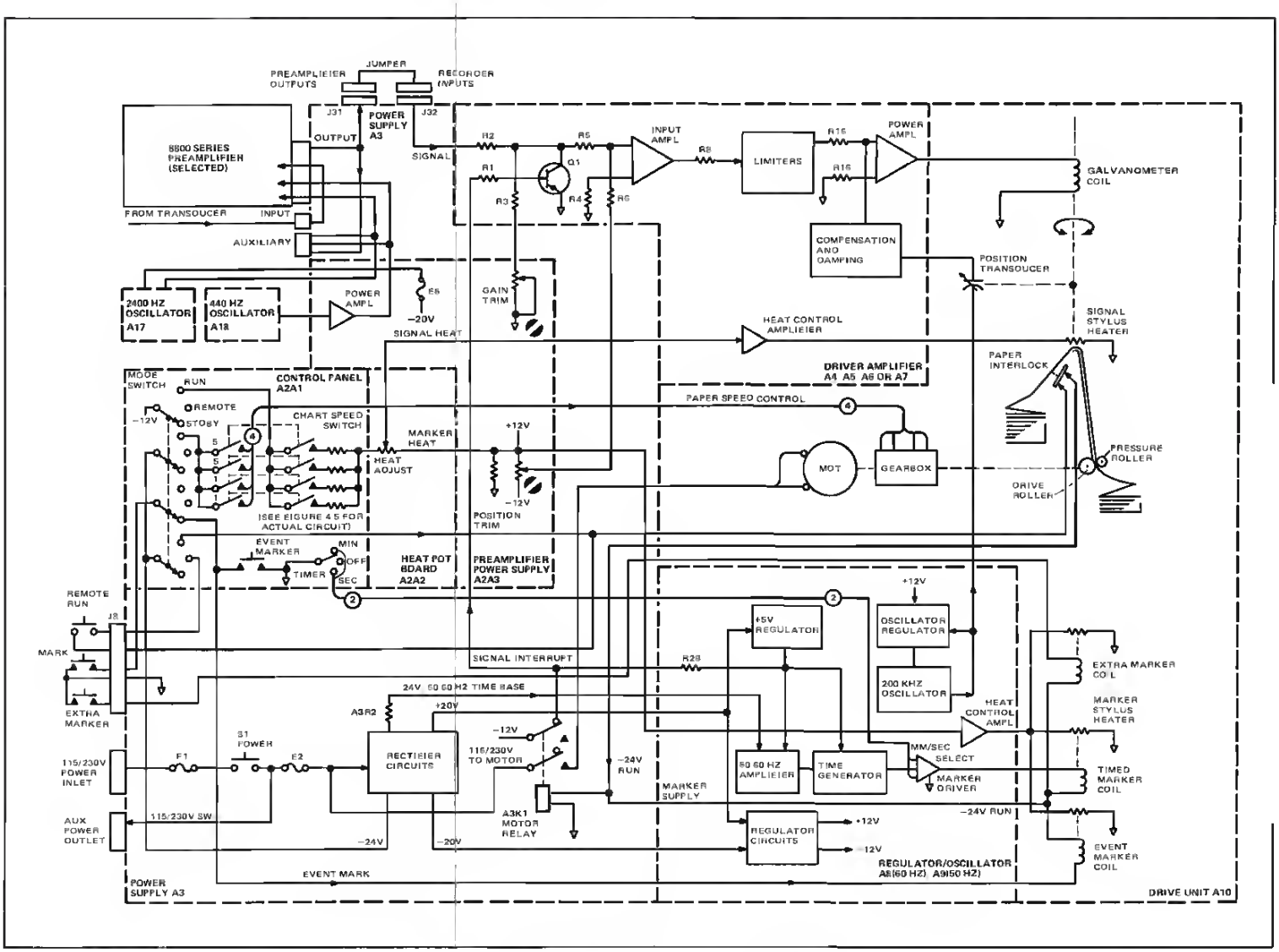


*Figure 4-1. Model 7754A Recorder, Block Diagram*



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# SECTION IV
# PRINCIPLES OF OPERATION

## 4-1. INTRODUCTION.

4-2. This section describes the principles of operation of the Thermal Tip Recorder. The Recorder includes signal, power control, and power circuits, and a chart drive mechanism. The signal circuits are described for one channel only, as all channels are identical. The power circuits and chart drive are common to all channels. This section provides functional block and schematic diagrams of the Recorder; for complete schematics, refer to Section VI at the rear of the manual.

4-3. As shown in the Block Diagram, Figure 4-1, the preamplifier signal is routed through a jumper cable on the rear panel to the driver amplifier, where it is amplified, limited, and combined with position feedback from the stylus position transducer. It is then amplified further and applied to the galvanometer, which drives the heated signal stylus, producing a trace on the heat-sensitive Permapaper. The Permapaper is pulled through the recorder by a drive roller, which is driven through a variable speed gearbox that is electrically controlled from the front panel. Four solenoids and gear sets are used in various combinations to produce the full range of chart speeds. In conjunction with speed selection, the selector switch varies the stylus heat so it is proportional to the chart speed. Heat adjustment controls on the front panel may be used to further vary the stylus heat to compensate for greater stylus travel caused by increased signal frequency. Other circuits in the recorder include marker, timing, rectifier, regulator, and oscillator circuits. A regulated oscillator provides a 200 kHz excitation signal for the position transducer. The block diagram shows the assembly location of these functional component groups as a troubleshooting aid.

## 4-4. PREAMPLIFIER POWER SUPPLY CIRCUITS.

4-5. Figure 4-2, a simplified schematic diagram, shows the preamplifier power and signal connections at the top, and, at the bottom, the recorder and preamplifier power supply circuits, including oscillators. The Preamplifier Power Supply board, A2A3, in addition to containing an oscillator fuse and power supply resistors, provides power amplification for the 440 Hz oscillator output, and connects the front panel circuit boards to the transfer board. Refer to the description of the recorder power supply for a description of these circuits.

4-6. Signals from the individual preamplifiers are routed into the power supply, on Transfer Board A3A1, and pass through the rear panel, a jumper cable, and back into the power supply. From there they are applied to the inputs of the four driver amplifiers, which are discussed next.

## 4-7. RECORDER SIGNAL CIRCUITS.

4-8. The signal processing circuits consist of the driver amplifiers, one for each channel, and the galvanometers. A simplified schematic diagram of these circuits is presented in Figure 4-3.

4-9. The signal from the preamplifier (or other source that can be connected to the RECORDER INPUT jack) enters the driver amplifier and is applied to a summing junction with the gain control signal and a transistor switch that shorts the junction to ground when the Recorder is in standby mode. The signal is applied through R5 to voltage amplifier U1 input with position control voltage (±10mm on chart) and amplifier feedback being applied at the same point. After amplification, the signal and its control components encounter the limiter diodes, which cut the signal off at adjustable high and low levels. The diodes are powered by emitter follower voltage sources (not shown). High, low, left, right, upscale and downscale are defined on the diagram. The signal, applied through R15 to amplifier driver U2, is then current-limited to 600 mA by transistors Q5 and Q8 and further amplified by power amplifier Q4, Q7 (not shown), Q6, Q9. A feedback circuit around the power amplifier and its driver acts as an output voltage limiter (±12.5V).

4-10. The galvanometer circuit receives the driver amplifier output signal, and the drive coil rotates a crank attached to the signal stylus, which marks the recording chart. The galvanometer shaft is also attached to a capacitive position transducer, described in Paragraph 4-14.

### 4-11. Stylus Linkage.

4-12. The linkage system shown in Figure 4-4 provides a linear motion at the stylus tip from the rotary motion of the galvanometer. The galvanometer moves the end of the crank arm through the arc of a circle, and the end of the crank arm moves the center of the stylus through the same arc. But because the inner end of the stylus frame is constrained by a bearing that can move only toward or away from the chart, the stylus tip moves in a straight line.

### 4-13. Galvanometer Position Feedback.

4-14. The position transducer consists of a capacitor with a split bottom plate, one top plate that excites both bottom



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plates, and a grounded rotor with apertures to permit passage of the 200 kHz excitation signal. The rotor is attached to the galvanometer shaft. The bottom plate is divided into four sections, connected diagonally (Figure 4-4) so that the excitation is received differentially. This differential action keeps the load on the excitation oscillator constant, to aid the oscillator regulator in maintaining a constant output current. Excitation signal amplitude is important since it affects position transducer sensitivity.

4-15. The demodulator circuit senses the unbalance between the two portions of the position sensing capacitor, caused by the amount of energy from the oscillator that is coupled through the apertures in the rotor on the galvanometer shaft. If the circuit is balanced, both halves of the position capacitor receive equal amounts of 200 kHz radiation from the oscillator output plate. Refer to Figure 4-4. On the positive excursion of the excitation signal (200 kHz), diode CR2 conducts, turning on transistor Q2 and charging C1. Diode CR1 is back-biased, and keeps Q1 cut off during this period. On the negative excursion of the excitation signal, the opposite current flow takes place, with Q1 cut off during this period. On the negative excursion of the excitation signal, the opposite current flow takes place, with Q1 conducting the same amount as Q2 conducted previously. When the circuit is balanced, C1 thus reflects a net zero voltage output. During an unbalanced condition, either Q1 conducts more or Q2 conducts more to produce an average positive or negative voltage on C1.

4-16. An example of unbalance is shown in Figure 4-4. As the positive signal causes the galvanometer to move the stylus as shown, the rotor moves so that more of the oscillator output is felt on the shaded pair of split capacitor plates. These plates are connected to the CR1-Q1 half of the demodulator, so that more negative voltage is impressed upon C1. The unshaded plates receive proportionately less of the oscillator output, and so CR2-Q2, the positive side of the demodulator, produces less positive output for C1. C1, then, sends a negative feedback voltage to the driver amplifier, which tends to return the stylus toward the center of the chart. The feedback voltage is aided by a torsion spring that facilitates setting of the stylus mechanical center. For maintenance purposes, note that one volt of position voltage corresponds to 10 divisions of stylus movement.

#### 4-17. Galvanometer Damping.

4-18. The position feedback signal is fed back to the driver amplifier through resistor R36. Part of the position voltage is fed back through C6 as velocity information and C4 and C5 as acceleration information. The amount of velocity feedback controls the damping, which is varied with R30.

4-19. DAMPING. Damping is a force that is (1) proportional to galvanometer velocity and (2) opposite to the direction of pen motor velocity. Figure 4-5 shows the effects of damping on frequency response and transient response, where underdamping produces peaked and oscillatory waveforms, and overdamping diminishes response. Optimum damping leaves about 71% of the original signal strength, so that the frequency response is about 3 dB down at the galvanometer's natural frequency and the response to a square wave (step function) input shows about 4% overshoot.

#### 4-20. Heat Control Circuit.

4-21. Stylus heat is controlled from the Heat Pot Board, A2A2, on the front panel. The heat control voltage is applied to a simple feedback amplifier located on the driver amplifier assembly, Q11, Q12, and Q13, which has a current limiting circuit similar to that used for the galvanometer. The amplifier output drives the resistive stylus heat element. A good stylus should have about 34 ohms resistance.

#### 4-22. Power Control Circuits.

4-23. Power is controlled from the recorder front panel. Figure 4-6 shows recorder power switching and fuses together with chart motor control circuits and speed control solenoid circuit.

4-24. Line common reaches the chart drive motor through S1, the power switch and S4, the voltage selector, whenever S1 is on. The high side of line power is applied to the chart drive motor through motor relay K1, which is actuated by the control switch RUN button through interlock S3 or by a remote run signal (Figure 2-8). The motor is described further in Paragraph 4-29. K1 also turns on stylus heat through the control switch.

4-25. The motor drives the gearbox, the speeds of which are controlled by speed selection solenoids L1, L2, L3, and L4. The speed control action of these solenoids is described in Paragraph 4-31. The segments of the control switch are so arranged that the solenoids are energized in the correct combination for each speed desired (Table 4-1). The switch is shown in the 1mm/sec position. As an example of how the switch works, the −24V supply voltage, applied to the switch via the main feeder line at the top of Figure 4-6 energizes the center contacts of the switch segment. When the pushbutton marked "1" is depressed, −24V is applied to solenoids L1 and L2 through resistors R8 and R7 respectively, selecting the proper gear combination. In speeds of 2.5mm/sec and higher, the heat control voltage is augmented by fixed voltages applied to the heat control potentiometers by the control switch. The heat control poten-



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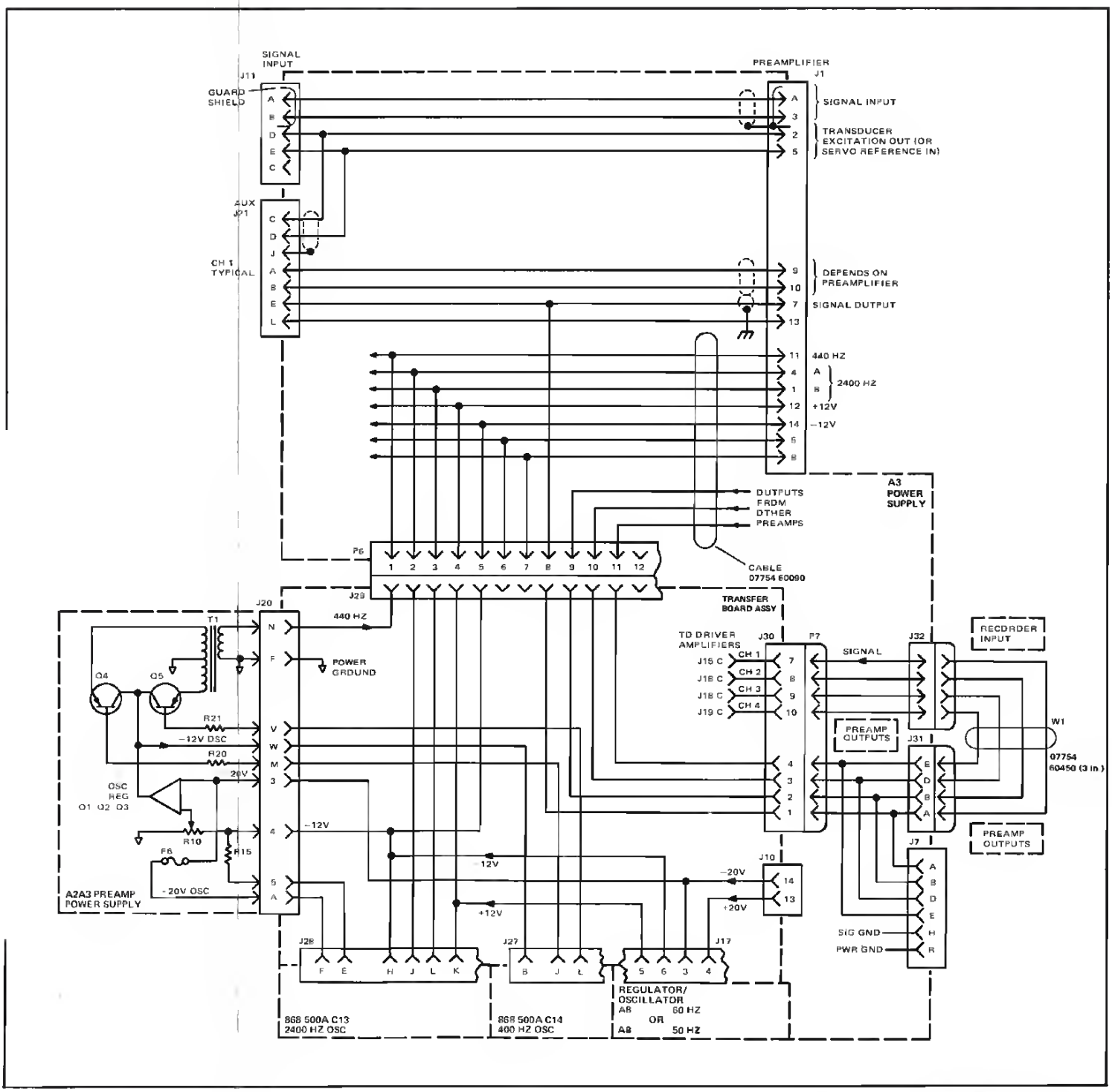


*Figure 4-2. Preamplifier Power Supply Circuits, Simplified Diagram.*



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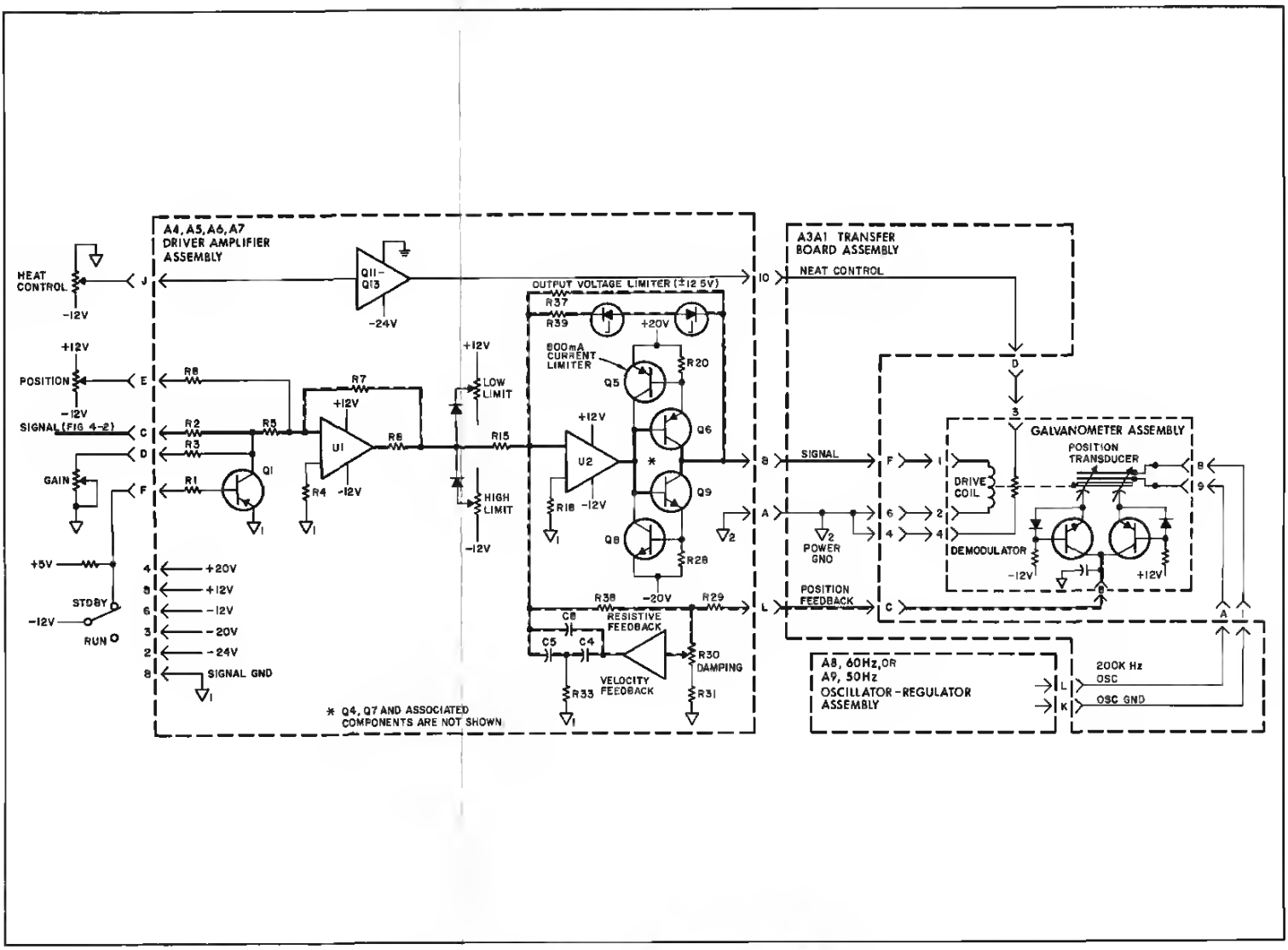


*Figure 4-3. Recorder Signal Circuits, Simplified Diagram*

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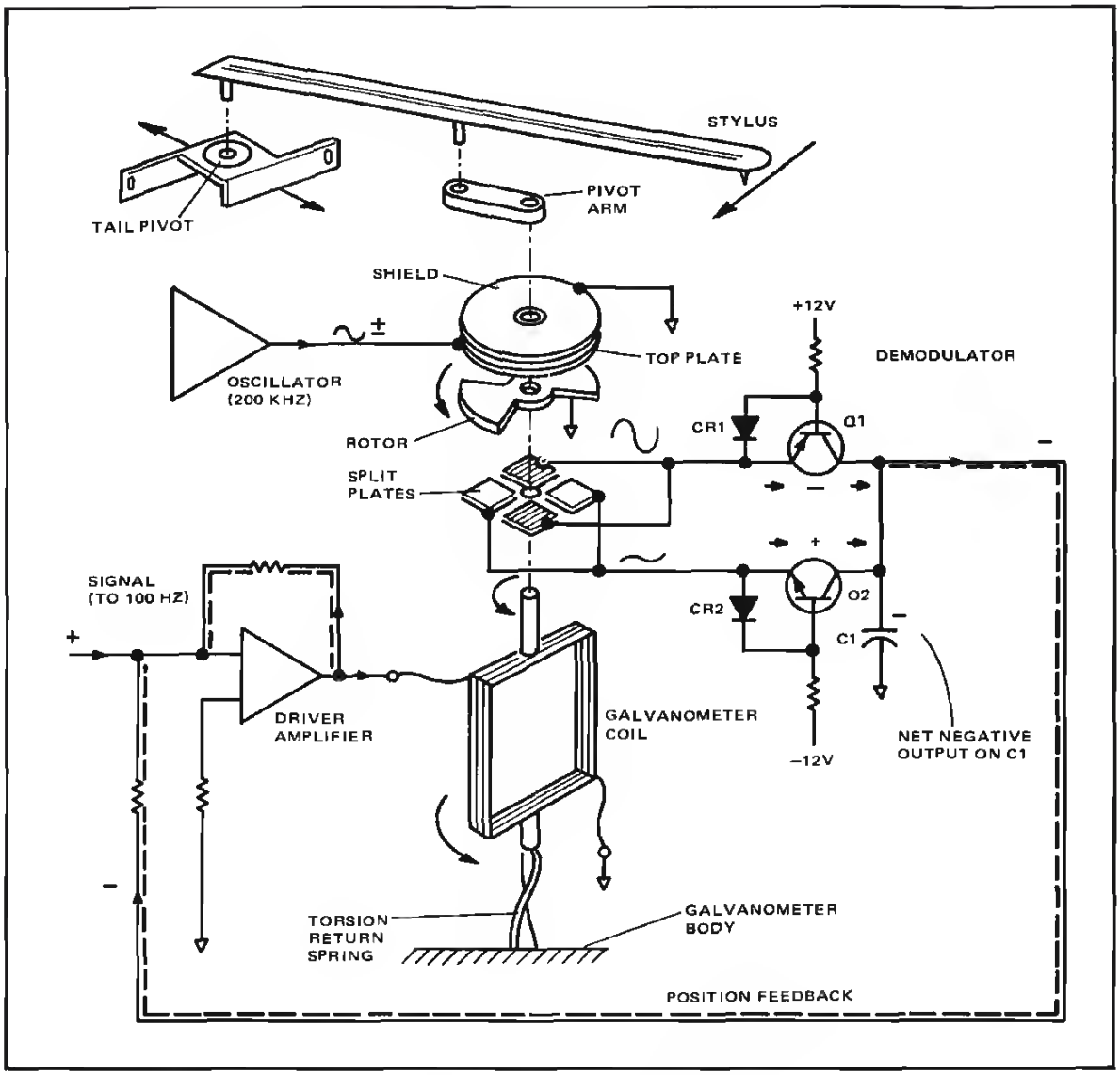


*Figure 4-4. Galvanometer Position Feedback Circuit*

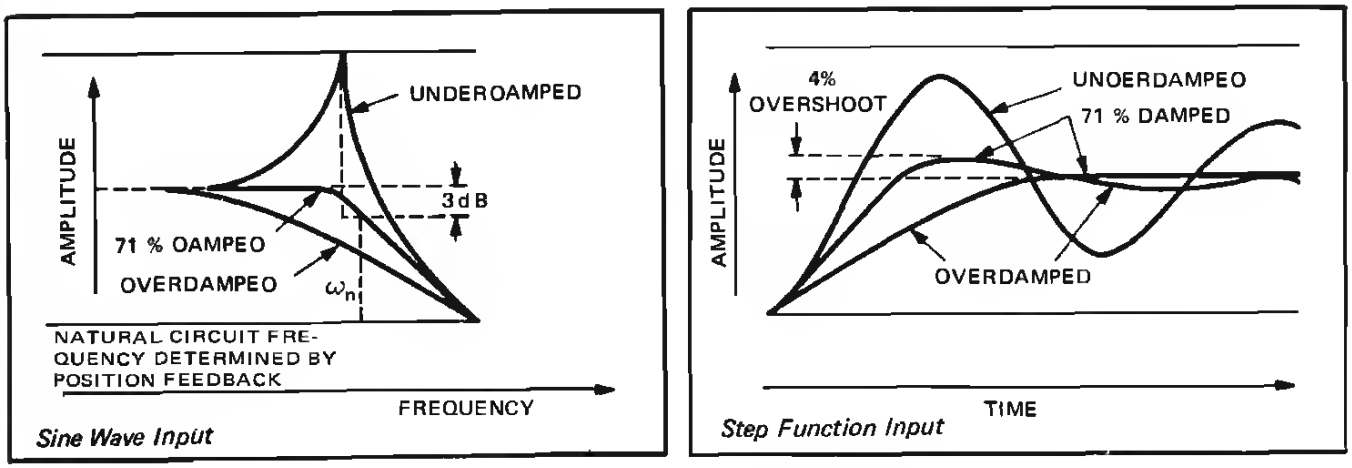


*Figure 4-5. Galvanometer Damping*


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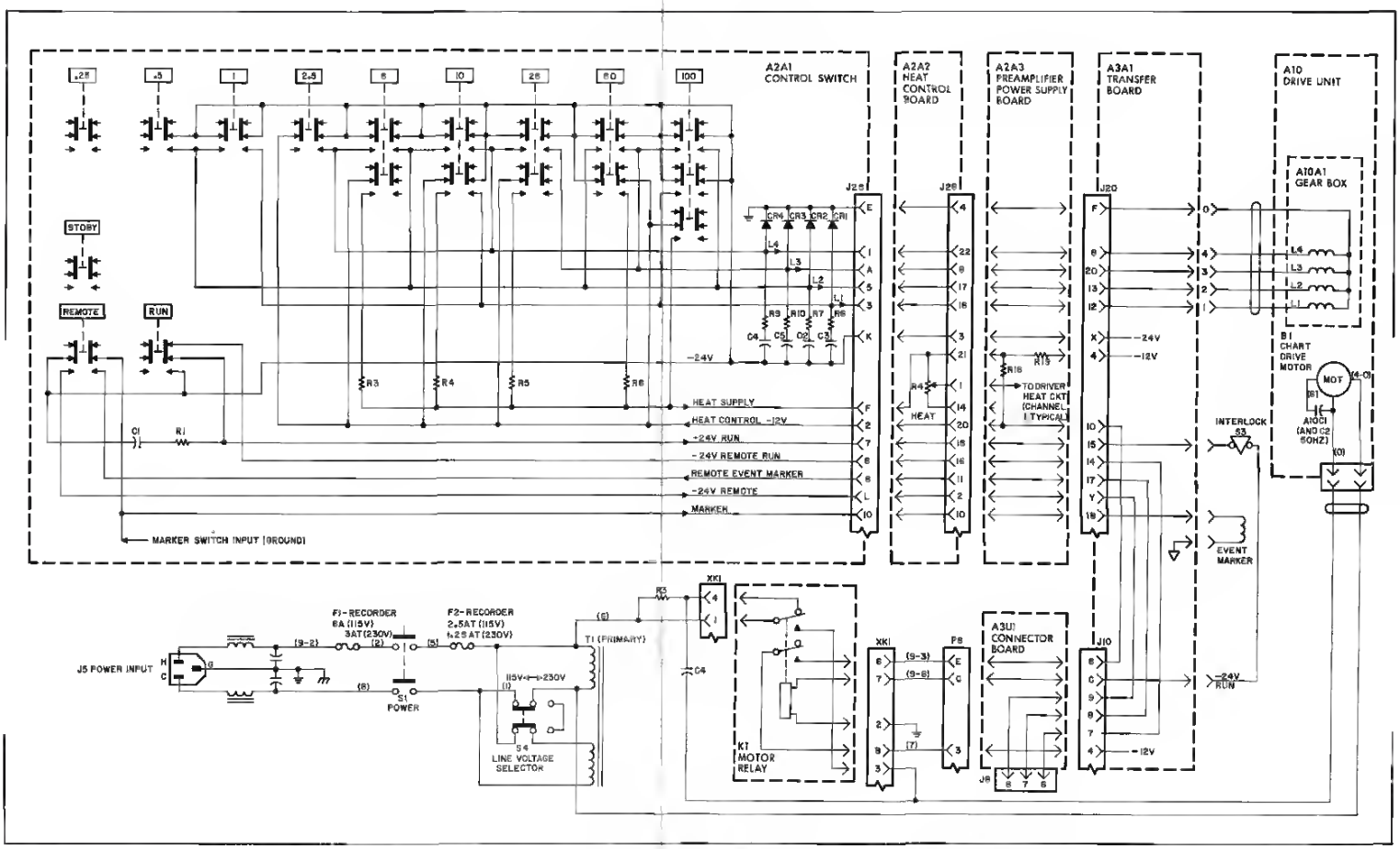


*Figure 4-6 Recorder Power Control Circuits, Simplified Diagram*



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tiometer setting permits front panel adjustment of the trace density through the heat control circuit in each driver amplifier (Paragraph 4-21).

### 4-26. CHART DRIVE.

4-27. The recorder chart drive consists of a 115 volt ac motor, a gearbox with four clutches and speed selection solenoids, a pair of paper drive rollers, and a paper brake bar.

#### 4-28. Chart Motor.

4-29. The chart motor is a continuous duty, synchronous motor with a speed of 450 rpm for 60 Hz operation. A sprocket gear on the motor shaft engages a drive chain that transmits power to the gearbox. To provide additional electrical safety, the motor is insulated from the recorder chassis by non-conducting spacers and an insulated sprocket gear at the gearbox input.

#### 4-30. Speed Control.

4-31. Chart paper speed is varied by a gear train consisting of sets of four gears, on two shafts (Figure 4-7). These shafts are fixed in place and do not rotate. Each set of four gears (A, B, C, and D) either provides a speed reduction with all four gears transmitting power, or no speed reduction, with power bypassing the reduction gears through a spring clutch that links gears A and D on the primary shaft. Gear D is machined together with Gear A of the next set, so power is directly transmitted to the next set of gears.

4-32. When direct drive is desired, the associated solenoid is energized, withdrawing the plunger from the clutch pawls. The clutch then engages, coupling gears A and D. The spring clutch between gears B and C automatically disengages since output gear C, being smaller than input gear B, rotates faster when gears A and D are in direct drive.

4-33. SPEED SELECTION SOLENOIDS. Solenoids L1, L2, L3 and L4 control the speed reduction. They are energized from Control Switch Assembly A2A1. The paper speeds obtained by energizing different combinations of solenoids are presented in Figure 4-8. Remember that as more solenoids are energized, the fewer are the sets of gears that provide speed reduction, and thus the paper goes faster.

4-34. POWER FLOW. The mechanical power flow through the gearbox is diagrammed, for each speed, in Figure 4-8.

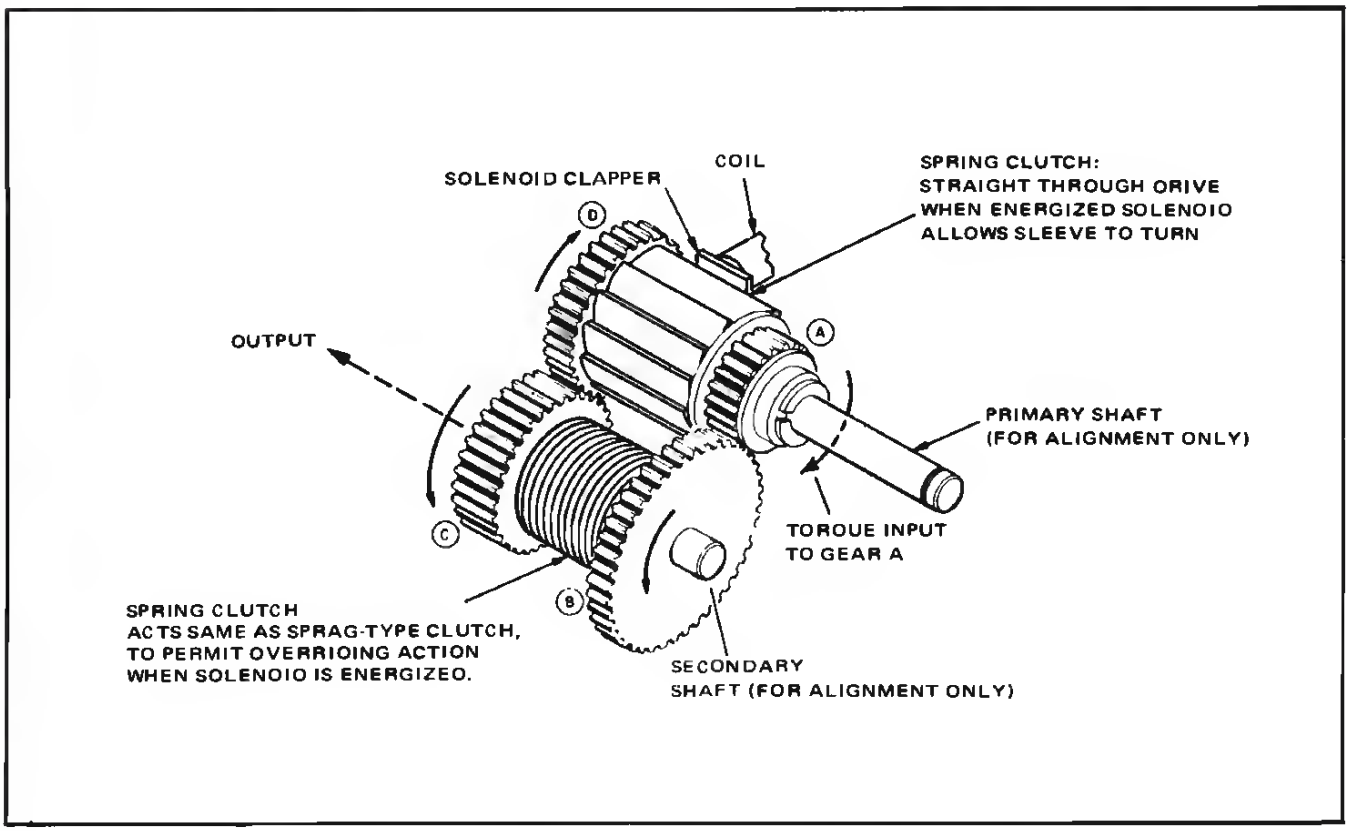


*Figure 4-7. Chart Drive Gears*



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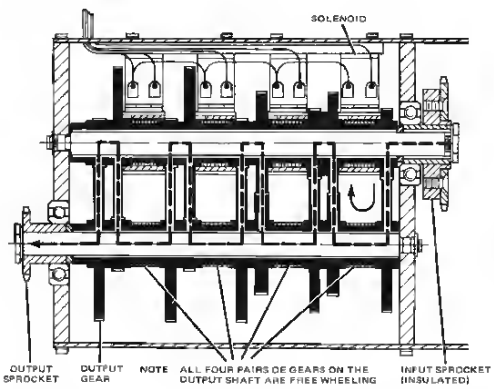
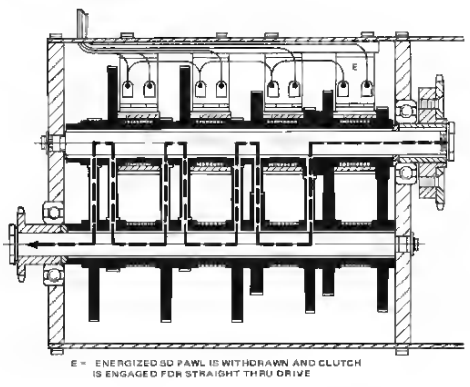
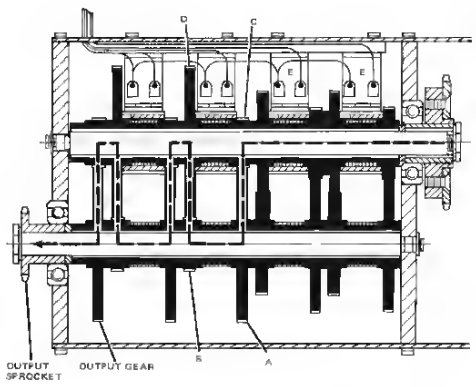

SOLENOID
OUTPUT SPROCKET
OUTPUT GEAR
NOTE ALL FOUR PAIRS OF GEARS ON THE OUTPUT SHAFT ARE FREE WHEELING
INPUT SPROCKET (INSULATED)

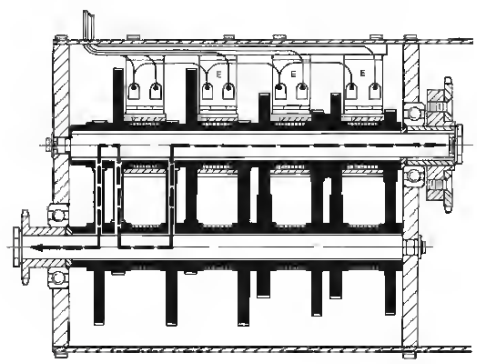
*25 mm/sec*



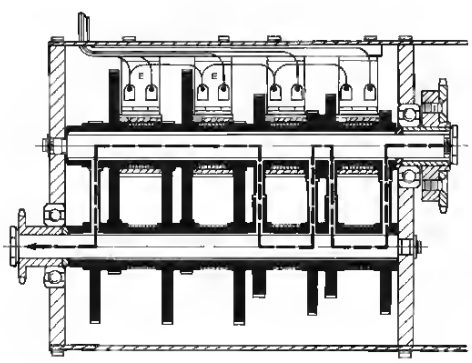

*0.5 mm/sec*



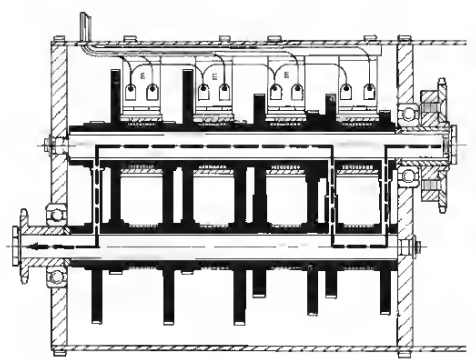

*1 mm/sec*



*10 mm/sec*



*25 mm/sec*



*50 mm/sec*

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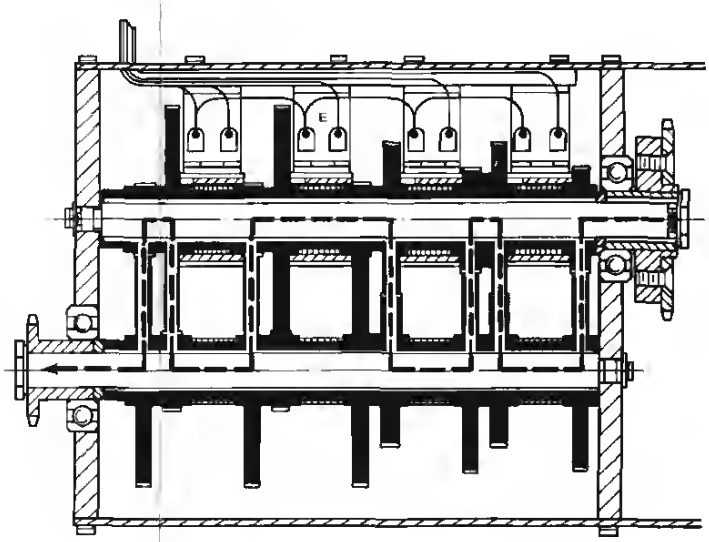
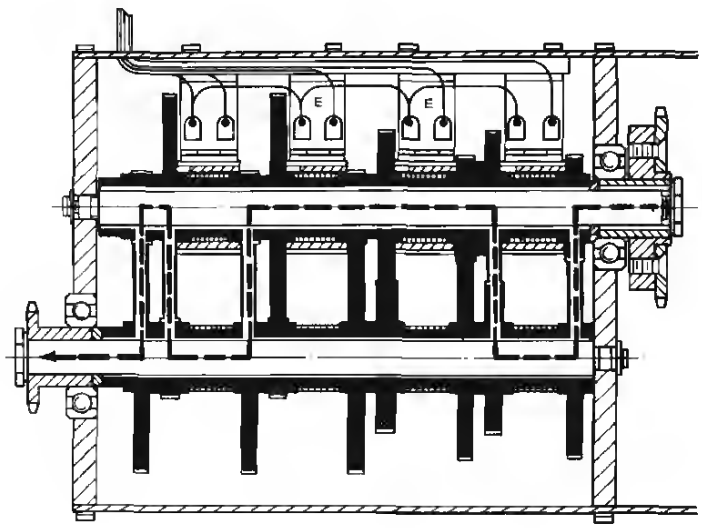
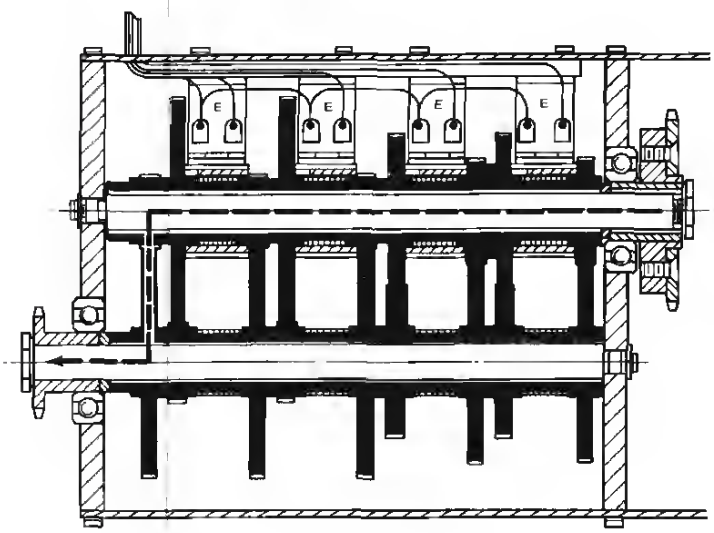


2.5 mm/sec



5 mm/sec



100 mm/sec

| Energized Solenoids | Paper Speed, MM/SEC | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.5 | 1 | 2.5 | 5 | 10 | 25 | 50 | 100 |
| L1 | | X | X | | | X | | | X |
| L2 | | | X | | X | X | | X | X |
| L3 | | | | X | X | X | X | X | X |
| L4 | | | | | | | X | X | X |

Note: When solenoids are deenergized, clutches are disengaged, permitting pairs of primary gears to transmit power. When solenoids are energized (power on), clutches are engaged, causing straight-through drive.

*Figure 4-8. Gearbox Power Flow*



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Take the 1mm/sec speed flow as an example (top row, third from left). Power input from the drive motor enters the gearbox via the input drive sprocket at the right side of the upper (primary) shaft. Since solenoids L1 and L2 are energized, the first two sets of gears are directly coupled to the input sprocket by the spring clutches. The third and fourth sets of gears provide speed reductions since L3 and L4 are deenergized and the associated clutches are kept from rotating by the released plungers. Power thus flows through all the gears in these two gear sets.

### 4-35. Paper Feed.

4-36. As shown in Figure 4-9, a paper brake arm establishes tension across the felt-covered paper brake bar. From the output of the gearbox, a chain drive runs a rubber drive roller. The drive roller pulls the chart paper at a uniform speed, slippage being prevented by a pressure roller that causes the paper to grip the drive roller. After the Z-fold paper leaves the drive roller, it folds sbeet by sheet onto a takeup tray provided with the bench-top enclosure, or into a takeup tray provided with the system cabinet or portable cart. The consecutively numbered chart pages indicate the amount of paper remaining, and can be used as an index for instant access to any part of the recording.

## 4-37. RECORDER POWER SUPPLY AND REGULATOR CIRCUITS.

4-38. The power supply contains rectifier and regulator circuits, a 200 kHz oscillator for the galvanometer position feedback circuit, and may have transducer-excitation oscillators (2400 Hz or 440 Hz) for the input circuits of some preamplifiers. Connections for these oscillators are shown in Figure 4-2, and the rectifier and regulator circuits are shown in Figure 4-10. In the figures, some elements such as current regulating circuits, bypass and suppression networks, some ground connections, minor feedback loops, filters, and coupling elements are omitted. Refer to Section VI for complete schematic diagrams.

### 4-39. Recorder DC Power Supplies.

4-40. The Recorder power supply rectifiers provide +20 volts, −20 volts and −24 volts dc as unregulated control and heat supply voltages. The voltages are filtered and fused on the power supply chassis, as shown in Figure 4-10.

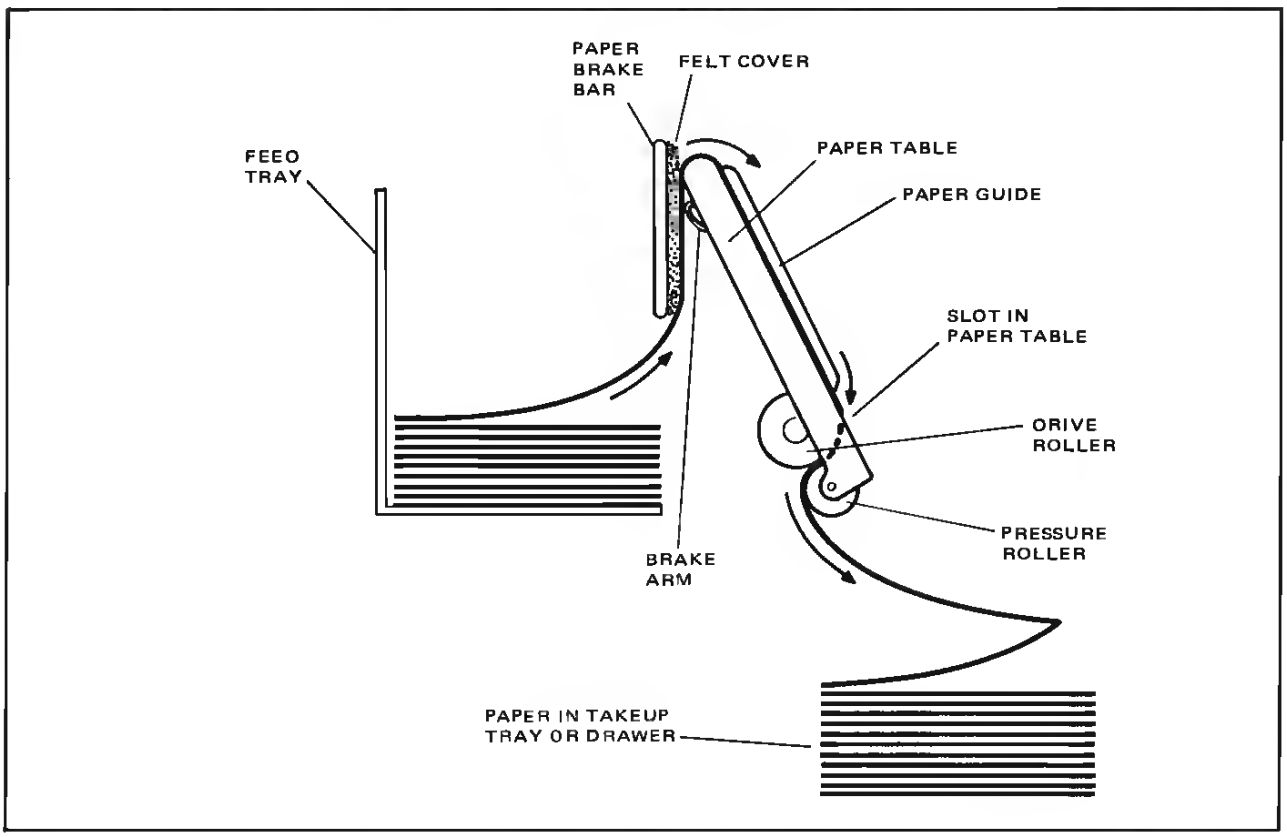


*Figure 4-9. Paper Feed Path*



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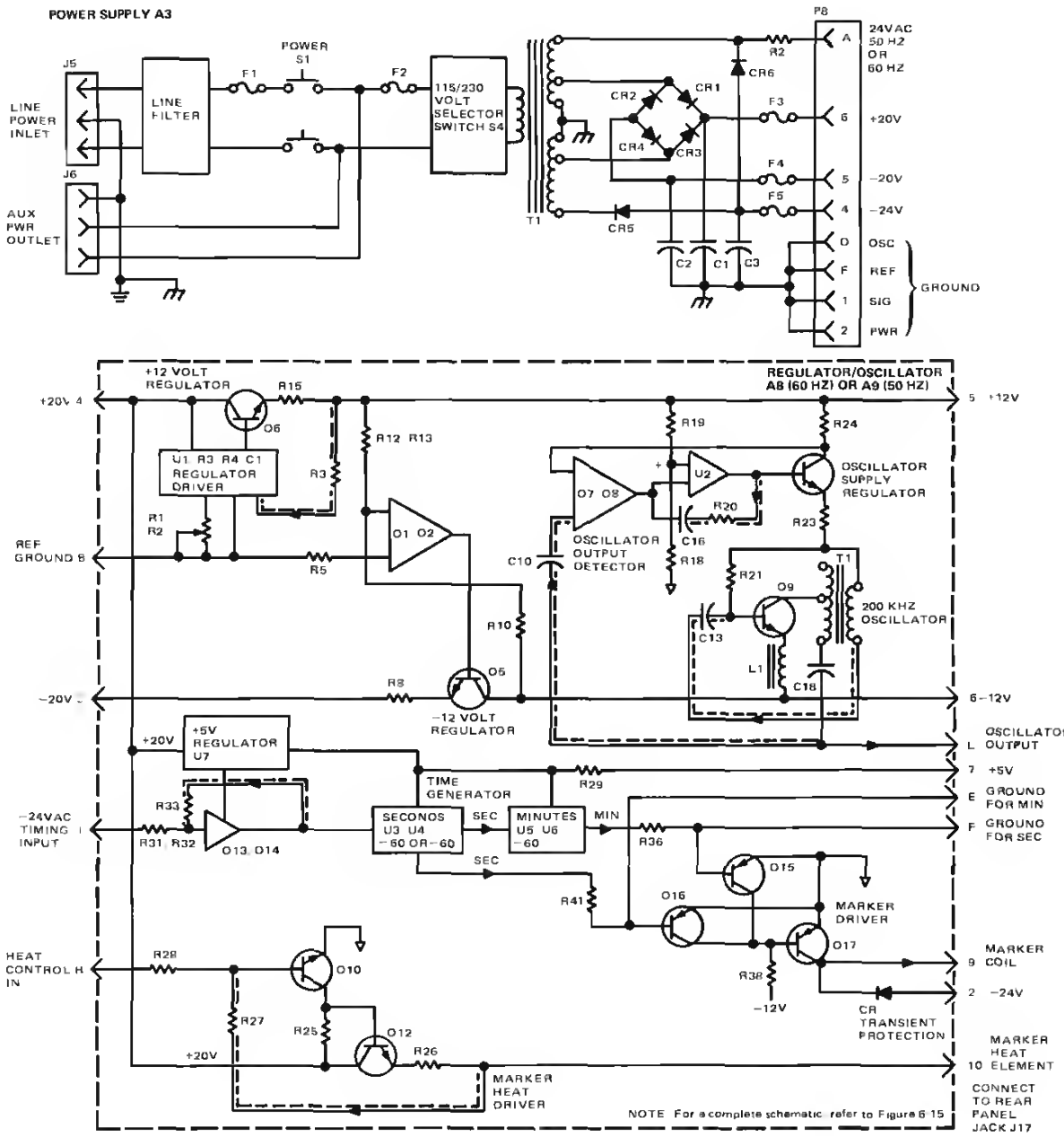


*Figure 4-10. Recorder Power Supply and Regulator Circuits, Simplified Circuit*

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**4-41. Regulator/Oscillator.**

4-42. The Regulator/Oscillator Assembly includes a +5V, a +12V and a −12V voltage regulator, a 200 kHz oscillator with a stabilizing regulator, and the timing circuits for the timed marker stylus. The relationship of these circuits is shown in Figure 4-10.

4-43. +5-VOLT REGULATOR. The +5 volt regulated supply is used in the timing generator, and in the signal interruption circuit of each driver amplifier. It is derived from the +20 volt unregulated supply with an integrated circuit voltage regulator that has an independent voltage reference. A resistor in series with the regulator absorbs some of the power dissipated in the regulation process, thereby reducing the amount of heat generated in the regulator.

4-44. +12-VOLT REGULATOR. The +12 volt supply is derived from +20 volts with an integrated circuit regulator used as a regulator-driver. Since the IC is not capable of handling the required power, an external power transistor, Q6, acts as the series regulator. The IC regulator incorporates a ±5% voltage reference. To adjust the voltage (within 100 millivolts), the circuit uses potentiometer R2 to reference ground. Resistor R15, one ohm in series with regulating transistor Q6, provides short circuit protection and has a current-sensing function. R4 and C1 form an RC network that improves the stability of the operational amplifier that drives Q6.

4-45. −12 VOLT REGULATOR. The −12 volt supply is derived from the −20 volt unregulated output. The −12 volt regulator is another operational amplifier, with the driven, series regulating element as Q5. Q1 and Q2 are the differential components of the amplifier. Q1 base is returned to ground via R5, and the reference input, derived from −12 volts through R12 and R13, is connected to Q2. The amplifier output drives Q5, and is returned to the reference input via feedback resistor R10. Current limiting is provided by R8 and Q4 (not shown in diagram), and RC network R6, C3 aids stability.

4-46. 200 kHz OSCILLATOR. The high frequency excitation signal, used in the galvanometer position capacitive transducer, is generated by L-C Oscillator Q9 and its associated circuitry. Random conductance in Q9 sets up currents in T1 which are fed back, in phase, to the base of Q9 through C13. Since feedback is greater than unity gain, oscillation amplitude is controlled only by saturation of Q9, and reaches nearly the power supply voltage. Oscillator frequency is determined by C15 and the external loading capacitance across the transformer primary together with T1 inductance. Filter choke L1, with C14 (not shown), decouples the oscillator and its harmonics from the −12 volt supply. A step-up winding, connected to C18, increases the oscillator output voltage by about 7 to 1.

4-47. OSCILLATOR REGULATION CIRCUIT. Since the position transducers are an important factor in recorder accuracy, the 200 kHz oscillator must remain extremely stable in operation. An indication of oscillator stability, both in frequency of oscillation and in amplitude, can be obtained by detecting the product of frequency and output voltage, and comparing the results with a reference voltage. The L-C oscillator circuit, by nature, exhibits frequency changes with variations in load. The oscillator regulation circuit varies the oscillator supply voltage to compensate for loading, which stabilizes the output.

4-48. To do this, the oscillator output detector generates a voltage proportional to frequency and amplitude of the 200 kHz component being removed by C11. This voltage is compared in differential amplifier U2 to a reference voltage (+4.23 volts), derived from the +12 volt supply through voltage divider R18-R19. The comparator output drives a series regulator transistor, part of U2, in such a way that the oscillator will maintain a constant output amplitude, and therefore a constant frequency.

**4-49. Marker Circuits.**

4-50. The Recorder includes two monopolar markers, one of which is timed, and the other actuated with a front panel or remote pushbutton. The timing circuits for the timed marker are located on the Regulator/Oscillator Assembly, and operate by dividing 50 or 60 Hz ac input to generate one-second pulses, and then dividing these pulses to obtain pulses at one-minute intervals. The selected set of pulses is then amplified to drive the timed marker.

4-51. Line frequency ac voltage at 24 Vac is obtained from the power transformer and filtered to remove transients and high-frequency noise. Then a threshold detector circuit, Q13-Q14, generates a train of spike waveforms at line frequency to drive the divider TTL logic circuitry. Integrated circuit U3 divides by 5 or 6, and then U4 divides by 10 to achieve a 50:1 or 60:1 division. The seconds output is routed to switch Q16, and also to the minutes divider, which divides by 60 in the same way, using IC's U5 and U6. The minutes output is routed to transistor switch Q15.

4-52. MARKER SWITCHES. When the circuit is off, both switches are grounded, stopping conduction in Q15 and Q16 and permitting Q17 to conduct steady-state. When either minute or second marking is selected, the ground is removed from one switch, which conducts and connects the base of Q17 to ground. Once each minute or second, the timing circuit cuts off the switch, thereby restoring the base



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drive to Q17 momentarily, so the marker coil is energized and the marker makes a jog on the paper. The diode at the collector of Q17 removes the large transient that results when the marker solenoid stops conducting.

4-53. MARKER HEAT DRIVER. The marker heat elements are powered from the −20 volt unregulated line. Heat regulation originates at the heat potentiometer subassembly of the front panel, and is applied to the base of Q10, which drives Q12, a series regulator that is similar to the voltage regulator circuits. Circuit feedback is applied for stability, and the circuit is protected against a shorted output by current limiter Q11 (shown in Figure 6-15).

**4-54. 440 Hz Oscillator.**

4-55. The 440 Hz oscillator circuit (Figure 4-11) consists of oscillator printed circuit assembly A2 and associated power regulation circuits on the power supply chassis. Power for the oscillator is regulated by Q2 and Q3 from the −20 volt oscillator supply (refer to Figures 2-4 and 6-7) on the Preamplifier Power Supply Assembly. The reference voltage is obtained from the −12 volt supply. Voltage divider R11 and R13 senses any change in the output of regulator Q3. The change is sensed by regulator driver Q1 and is applied to the base of Q3 to return the output to its former level.

4-56. Oscillations generated by push-pull oscillator Q12, Q13 are frequency stabilized by capacitor C15 and the primary windings of transformer T4, which together form a tank circuit in the oscillator output. Output from the secondary of T4 is controlled in amplitude by diodes CR21 and CR22 at a level determined by breakdown diode CR23. Each side of the T4 secondary is connected to half of push-pull power amplifier Q4, Q5 to drive output transformer T1. The output of T1 is distributed to the preamplifier connectors and the auxiliary power output connector as shown in Figure 4-2.

**4-57. 2400 Hz Oscillator.**

4-58. The 2400 Hz oscillator furnishes a transducer excitation signal to pressure amplifiers such as the Model 8805A or 8805B. The preamplifier further amplifies the excitation voltage for use with a transducer. Power for the oscillator (Figure 4-12) is provided by the −20 volt oscillator supply through series regulator Q19. The base of Q19 is held at a regulated −12 volts from the preamplifier regulated supply, providing collector voltage to Q20 and Q21 through the primary of T7. This voltage is filtered by capacitor C21.

4-59. Oscillations generated by push-pull oscillator Q20, Q21 are frequency stabilized at 2400 Hz by the primary of oscillation transformer T7, which, with the capacitance of C18 and C19, forms a tank circuit across the oscillator output. Thermistors RT7 and RT8 provide temperature stability. The output of T7 is a 2400 Hz sine wave balanced with respect to ground, with diodes CR25 and CR26 controlling the oscillation amplitude at a level determined by CR24. The differential signal is distributed to all channels and auxiliary power output connector J8.

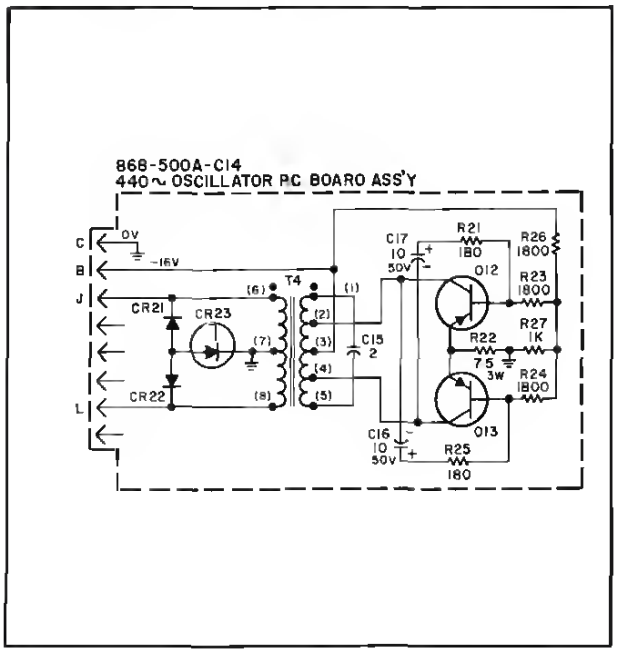


*Figure 4-11. 440 Hz Oscillator Circuit*

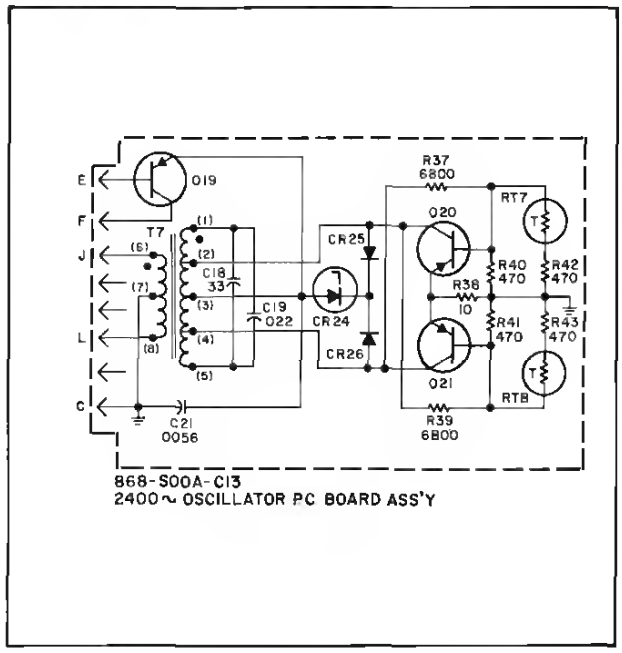


*Figure 4-12. 2400 Hz Oscillator Circuit*



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# SECTION V
# MAINTENANCE

## 5-1. INTRODUCTION.

5-2. This section provides maintenance and service information for the Hewlett-Packard 4-Channel Thermal Tip Recorder. Information includes:

| | |
|---|---|
| Performance Checks | Paragraph 5-5. |
| Preventive Maintenance | Paragraph 5-10. |
| Adjustments and Minor Repairs | Paragraph 5-20. |
| Overhaul and Lubrication (Gearbox) | Paragraph 5-49. |

For system troubleshooting information, refer to Table 5-3.

## 5-3. TEST EQUIPMENT AND LUBRICANTS.

5-4. The test equipment recommended for maintenance is listed in Table 5-1, with the performance characteristics required. Other test equipment may be used if its specifications equal those listed. For satisfactory performance, use only the lubricants listed in Table 5-2. Lubrication intervals are as follows:

Normal use in upper half of the speed range.
12 months or 2000 hours.
Slow speed use, over extended periods:
6 months or 1000 hours.

For further information, refer to Paragraph 5-49.

## 5-5. PERFORMANCE CHECKS.

5-6. The performance checks verify specifications and circuit operation, and can be used under the following circumstances:

*Table 5-1. Recommended Test Equipment*

| Instrument Type | Required Characteristics | Model Number of Instrument Recommended |
|---|---|---|
| Variable Autotransformer | 115 or 230 Vac; 0-130 Vac, 5 amperes; 0-260 Vac, 2.5 amperes | General Radio VARIAC |
| DC VTVM | 1 mV to 1000V full scale, 1 mA to 1 ampere | HP Model 412A or equivalent |
| Digital Voltmeter (DVM) | Range: 0-999.9V; Accuracy: ±0.05% | HP Model 3440A or equivalent |
| Function Generator | 0.01 Hz - 100 kHz 35V p-p open circuit output; 15V p-p into 600-ohm load | HP Model 3300A with Model 3301A Auxiliary Plug-in. Used with dual-banana to BNC adapter HP 10110A. |
| Oscilloscope | Sensitivity 5 mV/division or better. Vertical amplifier dc coupled, dc to 400 kHz or better | HP Model 140 with Time Base and any 1400-series Vertical Amplifier. |
| Stylus Pressure Tester | 25 grams maximum | HP Part No. 14023A or equivalent |
| Test Boards | PC Board Support for Driver and Regulator/Oscillator | 07754-00900 (Figure 5-2) |
| | Driver Amplifier Extender Board | 07754-00920 |
| | Regulator/Oscillator Extender Board | 07754-00910 |
| Test Cable | For test signals | To be made; see Figure 5-2 |
| Oscillator Load Plug | To load oscillator | To be made, see Figure 5-2 |



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*Table 5-2. Lubricants and Solvents Required*

| Type | Commercial Source or Hewlett-Packard Part No. |
|---|---|
| MACHINE OIL, No.10 | 6040-0220 |
| GEAR GREASE | 6040-0222 |
| CHAIN GREASE | 6040-0223 |
| PENETRATING OIL | Commercial, such as Marvel Mystery Oil |
| SOLVENT AND CLEANER | DOW Chlorothene (1,1-Inhibited Trichloroethane) |

a. As part of an incoming inspection;

b. Periodically, where maximum reliability is required,

c. To troubleshoot malfunctioning circuits; and

d. After repairs or adjustments.

5-7. To facilitate checking the Driver Amplifiers and the Regulator/Oscillator Assembly, extender boards (Table 5-1) are available as accessories.

**5-8. Variable Line Voltage.**

5-9. During the performance checks, the Recorder should be connected to the power source through an adjustable autotransformer so the line voltage can be changed ± 10% from the nominal 115 or 230 Vac.

**CAUTION**

**TO AVOID DAMAGE, REMOVE POWER FROM THE RECORDER BEFORE DISCONNECTING ASSEMBLIES OR COMPONENTS.**

## 5-10. PREVENTIVE MAINTENANCE

5-11. Preventive maintenance is recommended every six months or 1000 hours of operation and as an aid for minor repairs, adjustments and troubleshooting.

**5-12. Operational Checks and Inspection**

5-13. Switch Recorder power OFF. Inspect the Recorder for evidence of mechanical or electrical overload, dents, rust, and corrosion. Check that all components are securely mounted, including the cable connectors. Also check external connecting cables for strain, breaks, and frayed insulation. If the Recorder is installed in a cart or cabinet, the cables should be free when the Recorder is moved in and out.

**WARNING**

**TO PREVENT PERSONAL INJURY IF RECORDER SHOULD SLIDE PARTLY OUT, KEEP RECORDER ATTACHED TO CART OR CABINET WITH SCREWS IN FRONT PANEL AT ALL TIMES EXCEPT DURING MAINTENANCE.**

5-14. Operate the Recorder in all speed ranges, and perform the operating procedure, using all controls listed in Figure 3-1.

5-15. The following steps check operation of the Recorder:

a. **Recorder slides**: Check that the slides roll in and out smoothly and that they lock in the full open position (Figure 2-1).

b. **Paper tension**: Run the Recorder at the highest speed, and inspect paper travel over the platen at the paper table (See Figure 4-9). The paper should travel snugly over the paper table. Adjust the paper brake (Paragraph 5-24) if necessary, or clean or replace the brake felt (Paragraph 5-27).

c. **Paper tracking**. The paper brake should be slightly tighter at one side or the other so the paper will track consistently to the right and not weave back and forth. Run approximately 5 feet of the chart at 25 mm/sec. Marker styli are normally in a fixed position between channels. Remove the record and measure the distance between the marker trace and the edge of the chart paper. The measurement should be consistent within ± 0.5 mm all along the length of the record. Repeat this procedure at the 100 mm/sec speed. If the paper weave exceeds the limit, loosen the left paper brake adjustment screw slightly (Figure 5-1). If adjustment is difficult or if tracking problems persist, see Paragraph 5-24.

d. **Galvanometer to Paper Parallax**: So that all channels will have the same time reference with respect to the paper, all stylus tips must fall on the same time reference line of the paper, ± 0.25 division. To check parallax, apply power to the Recorder, and set to STANDBY mode. With finger pressure, gently move the stylus off center full scale, in the



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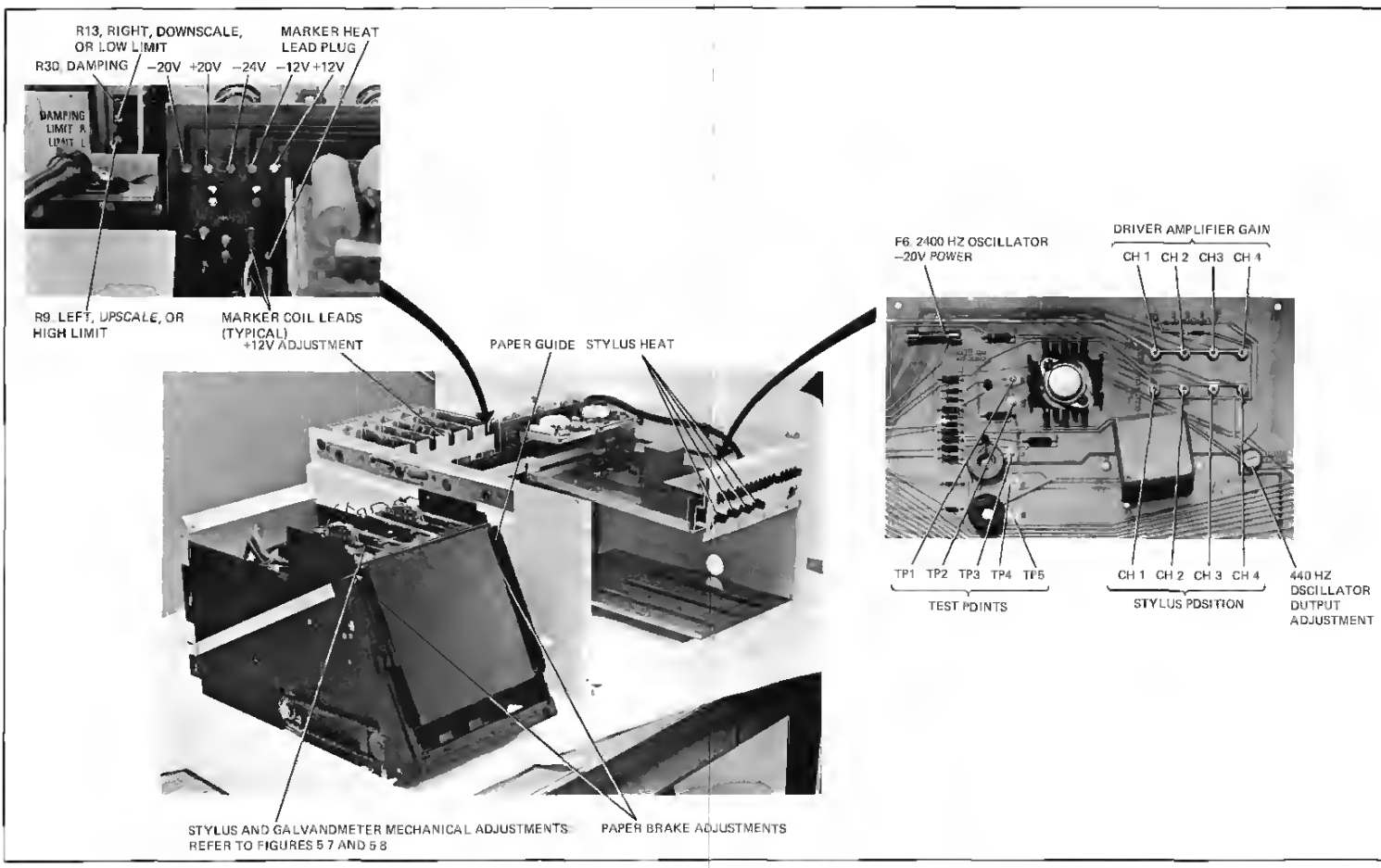


*Figure 5-1. Test and Adjustment Points*



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positive and negative directions. The trace line over the width of each channel should be ± 0.25 mm; if not, see Paragraph 5-33 to adjust stylus parallax. The time reference with respect to paper (full chart width or four channels) should be within ± 0.25 mm. If not, refer to Paragraph 5-34 for the channel time synchronization procedure, which is used to adjust galvanometer parallax.

e. **Signal Styli**: Inspect each signal stylus for cleanliness and condition. If a stylus is bent or twisted, replace it (Paragraph 5-35).

f. **Stylus Pressure**: When stylus pressure is too light, the trace lacks definition, but when pressure is too heavy, friction causes noticeable non-linearity and hysteresis. Refer to Paragraph 5-31 for stylus pressure adjustments.

g. **Marker Styli**: Inspect each marker stylus and solenoid for cleanliness and condition. Run a few feet of paper at 100 mm/sec while pressing the EVENT MARKER button, and with the timed marker in SEC mode. If the recording is unsatisfactory, check the marker stylus electrical connections and pressure (Paragraph 5-57). Recheck marker performance. If still unsatisfactory, troubleshoot the marker heat circuit, or replace the marker stylus.

h. **Stylus Heat**: Turn Recorder power ON, set SPEED to 25 mm/sec, and adjust STYLUS HEAT controls for best trace definition. Unlatch the Recorder (or raise the portable case lid), and rotate each preamplifier POSITION potentiometer (Figure 5-1) from one extreme to the other. Trace definition should remain the same over the whole channel width. If not, first check for an unlapped stylus. Then check for defects, improper clamping (Paragraph 5-29), or poor stylus pressure.

i. **Electrical Checks**: The electrical checks include adjustment of the electrical and mechanical limiting of stylus deflection. See Table 5-3.

*Table 5-3. Electrical Performance Checks and Adjustments*

A. UNREGULATED POWER SUPPLY CHECK
- a. Push recorder POWER ON-OFF switch so it pops out (OFF).
- b. Remove protective cover from J8 REMOTE to gain access to PC board connections.
- c. Insert connector body 1251-1190 into J8 to provide test points.
- d. Remove jumper cable (07754-60450) from J31-J32.
- e. Connect function generator (Table 5-1) to RECORDER INPUT connector J32 through signal test cable.
- f. Connect system to variable autotransformer (VARIAC). Set dial to 115 Vac, and push recorder POWER switch to it stays in (ON).
- g. Set function generator for 0.1 Hz square wave. Set amplitude dial fully counterclockwise (CCW)
- h. Rotate all stylus heat controls fully clockwise (CW).
- i. Set Recorder speed to 2.5 MM/SEC.
- j. Set MODE switch to RUN.
- k. Adjust function generator amplitude control so stylus motion covers complete chart width.
- l. Connect digital voltmeter (DVM) between Pin 1 (+20 volts) and Pin 11 (Power ground) of J8, and observe the following voltages on DVM:
  - (1) All styli at top of chart, about +18 volts.
  - (2) All styli at bottom of chart, about +20 volts.

  Note:
  Top of chart is to left.
- m. Connect DVM between Pin D (−20 volts) and Pin 11 of J8, and observe following voltages on DVM:
  - (1) All styli at top of chart, about −20 volts.
  - (2) All styli at bottom of chart, about −18 volts.
- n. Set MODE switch to STDBY.
- o. Lower paper table.
- p. Set MODE switch to RUN and SPEED switch to 100 MM/SEC.
- q. Connect DVM between Pin E (−24 volts) and Pin 11 of J8. DVM should read −24 volts dc.
- r. Set Function Generator amplitude control fully CW.
- s. Press interlock switch (Figure 5-14), located under paper table. DVM should read about −22.5 volts.
- t. Set MODE switch to STDBY.
- u. Push paper table up and in at bottom so it locks into place.

B. 440 HZ OSCILLATOR ADJUSTMENT. This procedure is to be performed only if the Option 005 Oscillator is installed.
- a. Push Recorder POWER switch so it pops out (OFF).
- b. Connect oscillator load plug, to one of four preamplifier connectors, *inside* the preamplifier housing (J1, J2, J3 or J4).
- c. Push POWER switch so it stays in (ON).
- d. Connect scope between Pin A (440Hz) and Pin 11 of J8.
- e. Adjust 440 Hz voltage output control R10



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*Table 5-3. Electrical Performance Checks and Adjustments (cont.)*

(Figure 5-1) for an output of 14.0 volts p-p on scope.

C. 2400 HZ OSCILLATOR CHECK

a. Connect scope between Pin 2 (OSC "B") and Pin 11 of J8; scope should read about 17.0 volts p-p.
b. Connect scope between Pin 3 (OSC "A") and Pin 11 of J8; scope should read about 17.0 volts p-p.
c. Set Recorder POWER switch to OFF.
d. Remove input cable from function generator, oscillator load plug, scope leads, and remove connector body from J8 REMOTE. Reinsert protective cover into J8.
e. Reconnect jumper cable on recorder rear panel.

D. REGULATOR/OSCILLATOR BOARD CHECK AND ADJUSTMENT.

Note:
Regulated voltages under test are loaded with preamplifiers installed in the recorder.

1. *+12 Volt Regulator Check and Adjustment.*
   a. Set Recorder POWER switch to OFF.
   b. Remove Oscillator/Regulator Assembly.
   c. Install extender board 07754-00910 and test fixture 07754-00900 on the assembly, as shown in Figure 5-3.
   d. Install extender board with regulator/ oscillator and test fixture into Recorder J17.
   e. Set Recorder SPEED switch to 2.5 MM/ SEC, MODE switch to STDBY, and POWER switch ON.
   f. Connect DVM between TP1 (+12 volts dc) and power ground.
   g. Set MODE switch to RUN.
   h. Position all styli to center scale with POSITION control on each preamplifier.
   i. Set MODE switch to STDBY.
   j. Check DVM for reading of +12.0 volts dc ±30 mV. If reading is beyond tolerance, adjust potentiometer R2 (Figure 5-4) for +12.0 volts dc ±30 mV.
   k. Change input voltage with Variac (Table 5-1) to 103 Vac and 127 Vac. DVM reading must not vary more than ±30 mV.
   l. Return Variac to 115 Vac setting.
   m. Disconnect test cable at DVM and connect it to scope.
   n. Set scope INPUT to AC, SWEEP to 5 MSEC/ CM, and SENS to 5 mV/CM.
   o. Ripple observed on scope must not exceed 5 mV p-p.
   p. Disconnect cable from scope and reconnect cable to DVM.
2. *–12 Volt Regulator Check.*

Note
Only the +12 volt regulator circuit is adjustable. The –12 volt regulator uses +12 volts as a reference.

   a. Connect DVM between TP2 –12V dc and power ground. The DVM must read –12.0 volts dc ±0.1 volt.
   b. Change input voltage with Variac to 103 Vac and 127 Vac. Reading on DVM must not exceed tolerance.
   c. Return Variac to 115 Vac.
   d. Disconnect cable at DVM, and connect it to scope.
   e. Set scope INPUT to AC, SWEEP to 5 MSEC/ CM, and SENS to 5 mV/CM.
   f. Ripple observed on scope must not exceed 5 mV p-p.
3. *200 kHz Oscillator Measurements.*
   a. Remove standard probe (1:1 probe) from scope, and connect 10·1 probe.
   b. Set scope controls as follows:

| Switch | Position |
|---|---|
| INPUT | AC |
| SWEEP | 2 uSEC/cm |
| SENS | 10V/cm |

   c. Connect scope between TP3 (200 kHz) and oscillator ground. There are other TP3's on other boards; this one is shown in Figure 6-15.
   d. Scope must show a pattern as in the following photograph.
   e. Remove 10:1 probe from TP3 and from scope.

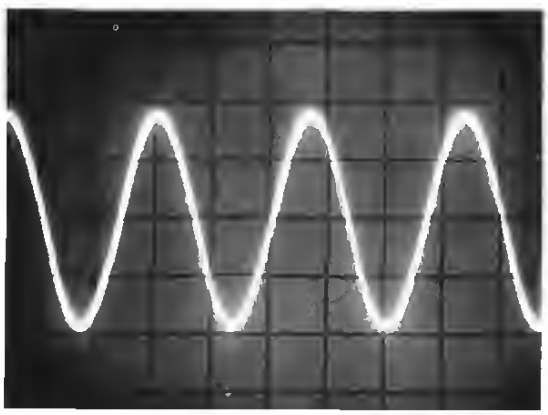



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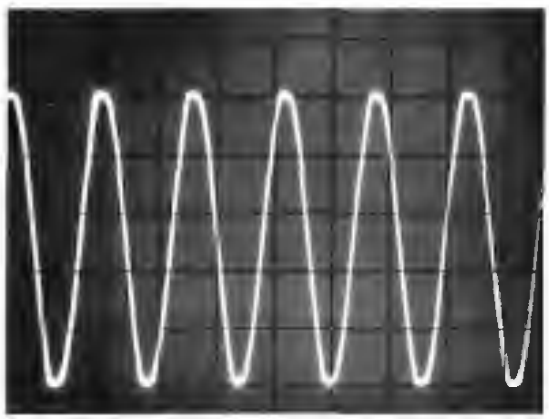
*Table 5-3. Electrical Performance Checks and Adjustments (cont.)*

4. *Input to Timing Generator.*
   a. Reinstall 1:1 probe on scope in place of 10:1 probe.
   b. Set scope controls same as in Step 3 except SWEEP to 10 mSEC/cm.
   c. Connect scope between TP4 (24 Vac, 50 Hz or 60 Hz), and power ground.
   d. Scope must show pattern as in following photograph.
   e. Remove scope probe from TP4.



5. *Output of Timing Generator.*
   a. Set scope controls as follows:

| Switch | Position |
|---|---|
| INPUT | DC |
| SWEEP | 5 mSEC/cm |
| SENS | 2V/cm |

   b. Connect scope (1:1 probe) between TP5 (collector of Q14) and power ground.
   c. Scope must show a pattern as in following photograph:

   d. Connect scope between TP6 and power ground.
   e. Set scope controls as follows:

| Switch | Position |
|---|---|
| INPUT | AC |
| SWEEP | 1 SEC/CM |
| SENS | 2V/CM |

   f. One pulse should appear on the scope every second (centimeter on the scale), of about +3.0V p-p.
   g. Connect scope between TP7 (Figure 5-4) and power ground.
   h. Set scope SWEEP switch to 5 SEC/CM.
   i. One pulse should appear every minute on scope, +3.0V p-p.
   j. Set recorder POWER switch to OFF.
   k. Remove extender board, Regulator/Oscillator board and support from Recorder. Remove extender and support from board.
   l. Reinstall Regulator/Oscillator board into Recorder J17 if satisfactory, otherwise make necessary repairs and retest.

E. PREAMPLIFIER POWER SUPPLY ASSEMBLY ADJUSTMENTS (07754-60140)

1. *Position Control Adjustments.*

Note

CHAN POS controls are only for trimming channels. To position stylus during operation, use preamplifier POSITION control.

   a. Remove small cable from rear panel of Recorder (07754-60450), to disconnect preamplifier signals from Recorder input.
   b. Set Recorder SPEED switch to 2.5 MM/SEC.
   c. Set MODE switch to RUN.
   d. Adjust Channel 1 position (CHAN POS 1) control on preamplifier power supply board to its complete range. Stylus 1 should be able to be positioned over ±10 divisions each side of center.
   e. Position stylus 1 to center of chart Channel 1.
   f. Repeat steps d and e for Channels 2, 3, and 4.
   g. Set MODE switch to STDBY position.

2. *Gain Control Adjustments.*
   a. Reconnect signal test cable (shown in Figure 5-2) to J32, and connect the dual banana plug to DC Standard 741 (Table 5-1), OUTPUT.
   b. Set output of dc standard to 0 volts.
   c. Set MODE switch to RUN, on 7754A Recorder.



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*Table 5-3. Electrical Performance Checks and Adjustments (cont.)*

d. Set dc standard output to +2.5V dc. All styli should move upscale (to left).
e. Adjust all GAIN controls on Preamplifier Power Supply board to set all styli accurately to 25 divisions deflection (top line on chart).
f. Reset dc standard output to 0 volts.
g. Repeat steps c, d, e, and f until an accurate 0 to 25 divisions gain is obtained.
h. Set Recorder MODE switch to STDBY.
i. Disconnect dual banana plug from dc standard.

F. STYLUS MECHANICAL LIMIT ADJUSTMENT

a. Connect dual banana plug on RECORDER INPUT TEST CABLE to Function Generator through HP dual to BNC adapter 10110A.
b. Set Function Generator frequency to 1 Hz, and output to triangular waveform. Set amplitude control to 5.0V p-p.
c. Set Recorder MODE switch to RUN.
d. Adjust LIMIT controls (R9 and R13, Figure 5-1 inset) on each Driver Amplifier board fully clockwise, to cause all styli to travel at least 2.5 divisions beyond chart channel edge.
e. Adjust Channel 1 right and left bumpers to limit travel of stylus to 2.5 divisions beyond top and bottom line of chart channel.
f. Repeat Step e for Channels 2, 3, and 4.

Note

Stylus travel beyond the edge of the channel grid must not interfer with any adjacent channel stylus or marker stylus when styli are at maximum excursion toward each other.

G. DRIVER AMPLIFIER ASSEMBLY ADJUSTMENTS

1. *Electrical Limiting Adjustment.*
   a. Adjust Channel 1 LIMIT L control (R9, Figure 5-1) to limit stylus travel to 1.5 divisions beyond top line of chart (turn ccw).
   b. Adjust Channel 2 LIMIT R control (R13, Figure 5-1) to limit stylus travel to 1.5 divisions beyond bottom line of chart (turn ccw).
   c. Repeat Steps a and b for Channels 2, 3, and 4.
   d. Turn amplitude control of Function Generator ccw so stylus travel stops at last grid line of chart top and bottom. Triangular waveform must not limit at either top or bottom of chart.
   e. Set MODE switch to STDBY.
2. *Damping Adjustments.*
   a. Push Recorder SPEED button for 10 MM/SEC speed.
   b. Adjust Function Generator output to 1 Hz square wave.
   c. Set Recorder MODE switch to RUN.
   d. Adjust Function Generator amplitude control to produce a 20 division deflection on Recorder chart.
   e. Adjust Channel 1 DAMPING control (R30, Figure 5-1 inset) so overshoot on chart does not exceed 0.8 division.
   f. Set MODE switch to STDBY.
   g. Set Function Generator output to 5 Hz sine wave.
   h. Set MODE switch to RUN.
   i. Adjust Function Generator amplitude control to produce full-scale (50 division) deflection on chart.
   j. Set Function Generator output to 50 Hz sine wave, stylus deflection must be no less than 45 divisions.
   k. Set MODE switch to STDBY.
   l. Repeat steps b through k for Channels 2, 3, and 4.
3. *Frequency Response Check.*
   a. Set Function Generator to 10 Hz sine wave.
   b. Push Recorder SPEED button for 10 MM/SEC speed.
   c. Set MODE switch to RUN.
   d. Adjust Function Generator amplitude control for a 10 division stylus deflection.
   e. Set Function Generator output to 100 Hz sine wave.
   f. Stylus must deflect 7.07 divisions (3 dB down) on chart.
   g. Set MODE switch to STDBY.
   h. Repeat steps a through g for Channels 2, 3, and 4.
4. *Linearity Check.*
   a. Set Function Generator output to 0.1 Hz triangular waveform.
   b. Push Recorder SPEED button for 10 MM/SEC speed.
   c. Set MODE switch to RUN.
   d. Adjust Function Generator amplitude for full-scale stylus deflection.
   e. Stylus must show less than ±0.25 division deviation from straight line.
   f. Set MODE switch to STDBY.



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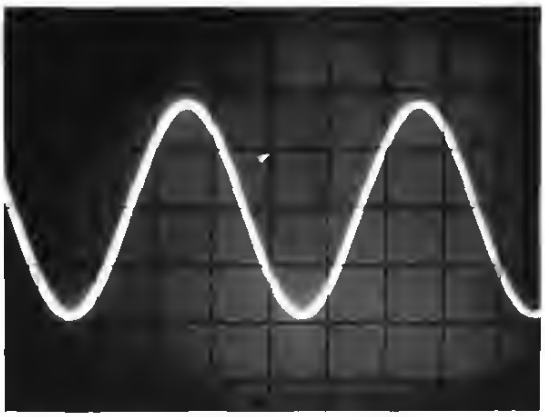
*Table 5-3. Electrical Performance Checks and Adjustments (cont.)*

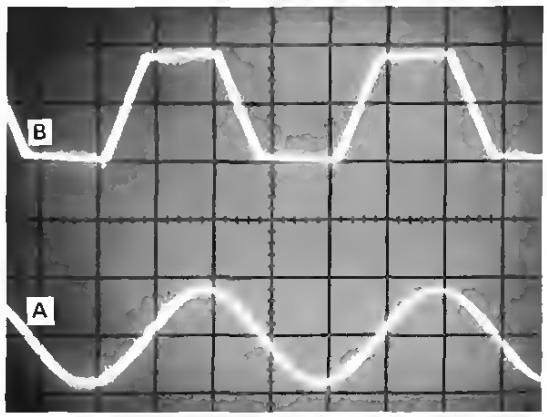
5. *Signal Waveform Measurements.*
   a. Press Recorder POWER switch to remove power (OFF).
   b. Remove Driver Amplifier Assembly (07754-60170) from channel to be tested.
   c. Install extender board (07754-00920) and plastic support (07754-00900) on Driver Amplifier Assembly.
   d. Install extender board, with Driver attached, to Recorder connector from which Driver was removed.
   e. Press Recorder POWER switch to apply power (ON).
   f; Adjust Function Generator output to 50 Hz sine wave.
   g. Set scope controls as follows:

| Switch | Position |
|---|---|
| INPUT | AC |
| SWEEP | 5 MSEC/CM |
| SENS | 0.5V/CM |

   h. Connect scope between TP1 (Figure 5-5) and signal ground.
   i. Push Recorder SPEED button for 2.5 MM/SEC.
   j. Set MODE switch to RUN.
   k. Adjust Function Generator amplitude for full scale stylus deflection.
   l. Scope must show a pattern as in the following photograph:



   m. Connect scope between TP2 and signal ground.
   n. Set scope SENS control to 10V/CM.
   o. Scope must show pattern same as "A" in following photo.
   p. Turn Function Generator amplitude control clockwise to cause limiters to limit signal. Scope must show pattern same as "B" in following photo:




   q. Turn Function Generator amplitude control to produce full scale deflection on chart without limiting.
   r. Set Recorder MODE switch to STDBY.
   s. Connect scope between TP3 of Driver Amplifier and signal ground, and set Scope controls as follows:

| Switch | Position |
|---|---|
| INPUT | AC |
| SWEEP | 5 MSEC/CM |
| SENS | 1V/CM |

   Scope should show pattern as in following photo:

   t. Connect scope between TP4 and signal ground, and set scope SENS to 5V/CM. Scope must show pattern as in following photo:



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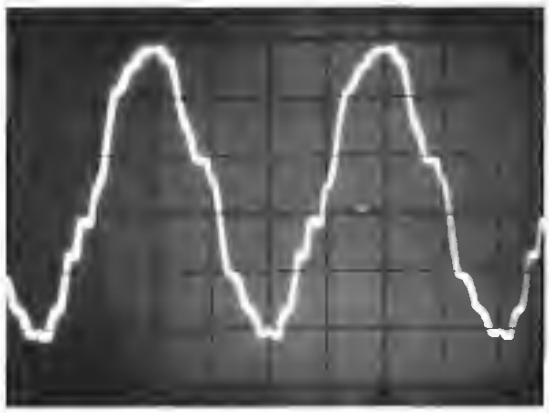
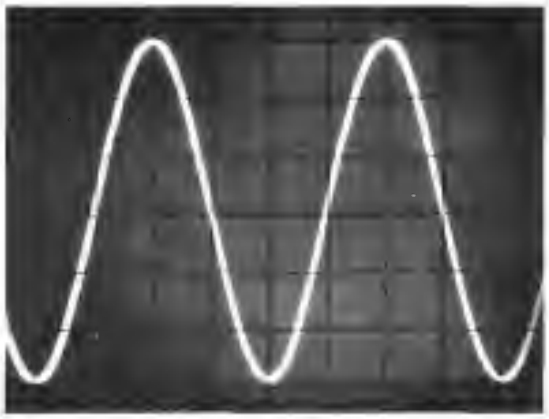
*Table 5-3. Electrical Performance Checks and Adjustments (cont.)*





u. Connect Scope between TP5 and signal ground, and set scope SENS control to 1V/CM. Scope must show pattern as in following photo:

v. Set MODE switch to STDBY and remove test cable from J32 on rear of Recorder. Reconnect jumper cable 07754-60450 to J31 and J32.

6. *Driver Heat Control Amplifier Check*

a. Connect Digital Voltmeter (DVM) between TP6 (Figure 6-13) and power ground.

b. Set all Recorder STYLUS HEAT controls fully clockwise.

c. Push Recorder SPEED button for .25 MM/SEC and set MODE switch to RUN.

d. Push Recorder SPEED buttons in sequence, and observe following readings on DVM; return MODE switch to STDBY for last reading:

| SPEED MM/SEC | DVM | SPEED MM/SEC | DVM |
|---|---|---|---|
| .25 | −6.4 Vdc | 10 | − 8.4 Vdc |
| .5 | −6.4 Vdc | 25 | − 9.8 Vdc |
| 1 | −6.4 Vdc | 50 | −11.0 Vdc |
| 2.5 | −6.4 Vdc | 100 | −11.9 Vdc |
| 5 | −7.7 Vdc | STDBY | − 5.7 Vdc |

**5-16. Cleaning.**

5-17. Depending on environmental conditions, cleaning may be required at much shorter intervals than the regular maintenance intervals.

a. Unplug Recorder power cord. Remove chart paper. Expose top and rear of Recorder, and remove dust with a vacuum hose.

b. Clean Recorder and Preamplifier front panels and controls with a soft, lint-free cloth or a wax-impregnated polishing cloth.

**CAUTION**

**IF A SOLVENT IS NECESSARY TO CLEAN THE PANEL, USE ONLY CHLOROTHENE OR ETHYL ALCOHOL. OTHER SOLVENTS, SUCH AS ACETONE OR ISO-PROPYL ALCOHOL, MAY REMOVE PANEL PAINT OR MARKINGS. IF THE PANEL MUST BE MARKED, FOR INSTANCE WITH CHANNEL IDENTITY, USE ONLY CHINA MARKING WAX CRAYON, OR COLOR-CODED EMBOSSING TAPE. DO NOT USE FELT, NYLON, OR BAMBOO-TIPPED MARKERS ON THE INSTRUMENT PANEL OR THE MARKING MAY DISCOLOR THE PANEL PAINT PERMANENTLY.**

c. Pull the paper table out at the bottom (Figure 3-2, Step 2). Clean the black surface of the paper table with Chlorothene solvent. On the rear surface of the table, clean the metal pressure roller and the metal paper brake arm with Chlorothene. At the bottom front of the Drive Unit, clean the rubber drive roller with Chlorothene (Figures 5-13, 5-14).

d. Carefully clean the writing and marker styli with Chlorothene. Do not use steel wool or abrasive cleaning compounds.

**5-18. Lubrication.**

5-19. Minor lubrication should be performed during preventive maintenance. Major lubrication (minor lubrication plus gearbox) is done at overhaul and at regular intervals of 12 months or 2000 hours operation, if used mostly in the upper half of the speed range. If the Recorder is used mostly for low speed operation, more clutches are engaged and



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more reduction gears are used. Thus, a more frequent lubrication may be required, typically every 6 months or 1000 hours. To help assure uninterrupted service if an extended period of recording is anticipated, overhaul and lubricate the Recorder before placing it on line. Lubricants are listed in Table 5-2. Lubrication points are shown in Figure 5-6.

## 5-20. ELECTRICAL CHECKS.

5-21. For electrical performance checks and adjustments, refer to the procedures in Table 5-3. To remove and replace the Driver Amplifier, Regulator, and Power Supply Assemblies, see Figure 5-2 and 5-3. Driver Amplifier Board test points are shown in Figure 5-4. Regulator/Oscillator Board test points are shown in Figure 5-5.

## 5-22. ADJUSTMENTS AND MINOR REPAIRS.

5-23. Mechanical adjustments are confined to the paper drive and galvanometer assemblies. Paper drive minor repair and troubleshooting information is presented in Table 5-4. If necessary, galvanometer superficial parts may be replaced only to the extent indicated in the Replaceable Parts List. Do not attempt to disassemble the Galvanometer, but return it to HP for service.

### 5-24. Paper Drive Adjustments.

5-25. The rubber drive roller pulls paper over the paper table, where it is aligned by the paper guide. The paper is kept snug on the table by the paper brake pad, which presses the paper against a felt-covered plate. The paper is kept from slipping on the drive roller by a spring-loaded pressure roller. To set up the Recorder so that styli run on the channel centerlines, the paper is first adjusted to run at the right edge of the paper guide, which is fixed in location. Then the stylus position for each channel is adjusted (see Table 5-3), the mechanical limit stops are adjusted, and the electrical limiters are adjusted.

5-26. PAPER BRAKE ADJUSTMENT. The paper brake may have to be adjusted occasionally as the felt compacts and wears. In all cases, the Recorder should pull the paper snugly, but not tightly, over the paper table. If adjustment is difficult, refer to Paragraph 5-27 and renovate or replace the felt backing. Load paper into the Recorder (Figure 3-2), and run it at 25 mm/second. The paper should settle at the right edge of the paper guide (Figure 5-1). If not, lower the paper table and attempt one of the following adjustments.

a. If paper climbs or wrinkles against right edge, loosen left adjustment screw by turning it *clockwise* (Figure 5-1).

b. If paper climbs against left edge, loosen right screw by turning *clockwise*.

c. If paper weaves, or alternately moves from side to side, tighten left screw slightly by turning it counterclockwise.

Allow paper travel so paper feed and possible paper weave can be observed. Make further corrections as needed. If the paper brake arm has been replaced, take up on the adjustment screws all the way (CW), then release them *equally* until braking action is correct, by checking paper speed, and paper snugness over the platen. The paper may weave slightly. To correct this weaving, adjust the paper brake arm slightly at the left by tightening the left screw (CCW) so drag will be greater at the left. Adjust arm progressively until the paper settles to the right.

5-27. PAPER BRAKE FELT RENOVATION. If the paper brake adjustment is difficult or "touchy", the paper brake felt may be worn out or compressed. If the paper weave cannot be corrected, the felt may be compressed more on one side than the other, or be misadjusted. Renovate the felt as follows:

a. Lower paper table and inspect felt. If it is worn badly, replace it. If it is coated with plastic from Permapaper, renovate it (below) and turn it inside out so fresh surface is exposed. If it is not excessively coated, clean and expand felt as follows.

(1) Using a flat-blade screwdriver as a lever, pry retaining rod from top of felt, as shown in Figure 5-7.

(2) Lower felt and remove retaining strip at bottom of felt.

(3) Wash felt in Chlorothene solvent with stiff brush to remove all traces of chart paper plastic residue. While it it is still wet, uniformly fluff it with compressed air (aerosol can or air hose), or let it dry and then brush it again.

(4) Reinstall felt with retaining strip at bottom, and retaining rod at top, by levering from back of top bar as shown in Figure 5-7.

b. Readjust paper brake (Paragraph 5-24), but not so tightly as to affect paper timing.

5-28. PAPER TIMING CHECK. The timed marker is used to check the paper speed accuracy. Since this marker is timed from line frequency and the paper drive motor is a synchronous type operating at a multiple of line frequency, the two should coincide exactly. This test therefore checks for mechanical slippage and stretched paper or incorrect paper brake adjustment.

a. Set the TIMER to SEC, the SPEED to 25 MM/SEC, and MODE to RUN. Turn on Recorder power. Run a few feet of paper and set MODE to STDBY.



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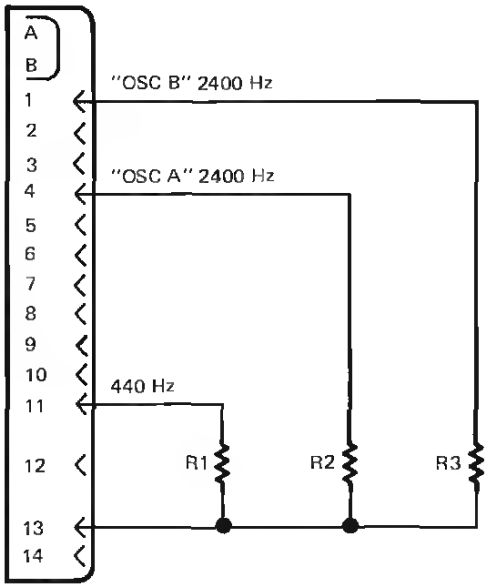


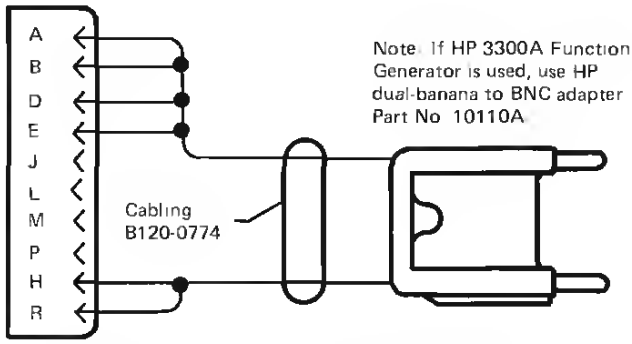

OSCILLATOR LOAD PLUG

R1 is 12.5 ohms, 5 W

R2 is 1 K ohms, ¼ W

R3 is 1 K ohms, ¼ W

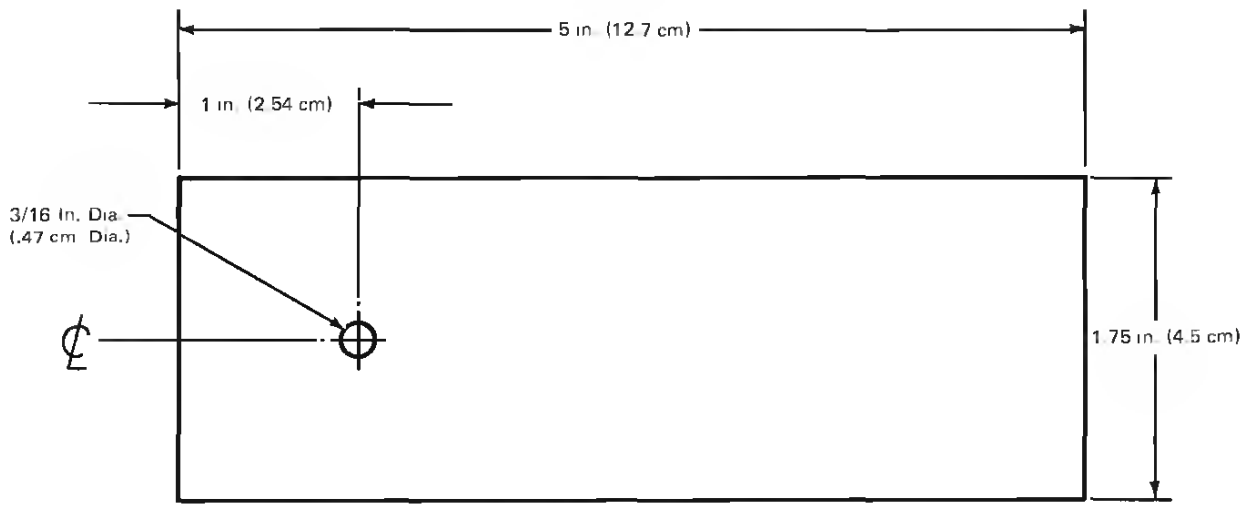
Connector is HP Part No. 1251-1843




SIGNAL TEST CABLE

Block 1251-1682
Catch 1251-1694
Soc Guide 1251-1005
Pin Guide 1251-1006
Contacts 5080-3772
(6 required)
2-pin Plug 1251-1818
Clamp 1251-1697
Nut 0590-0494 (2 req'd)

Dual Banana Plug, HP 1251-1818
General Radio 274-MB
Superior 1PG-2
National Type FWA
Johnson 108-202




PC BOARD TEST SUPPORT

*Figure 5-2. Test Cable, Plug and Fixtures*



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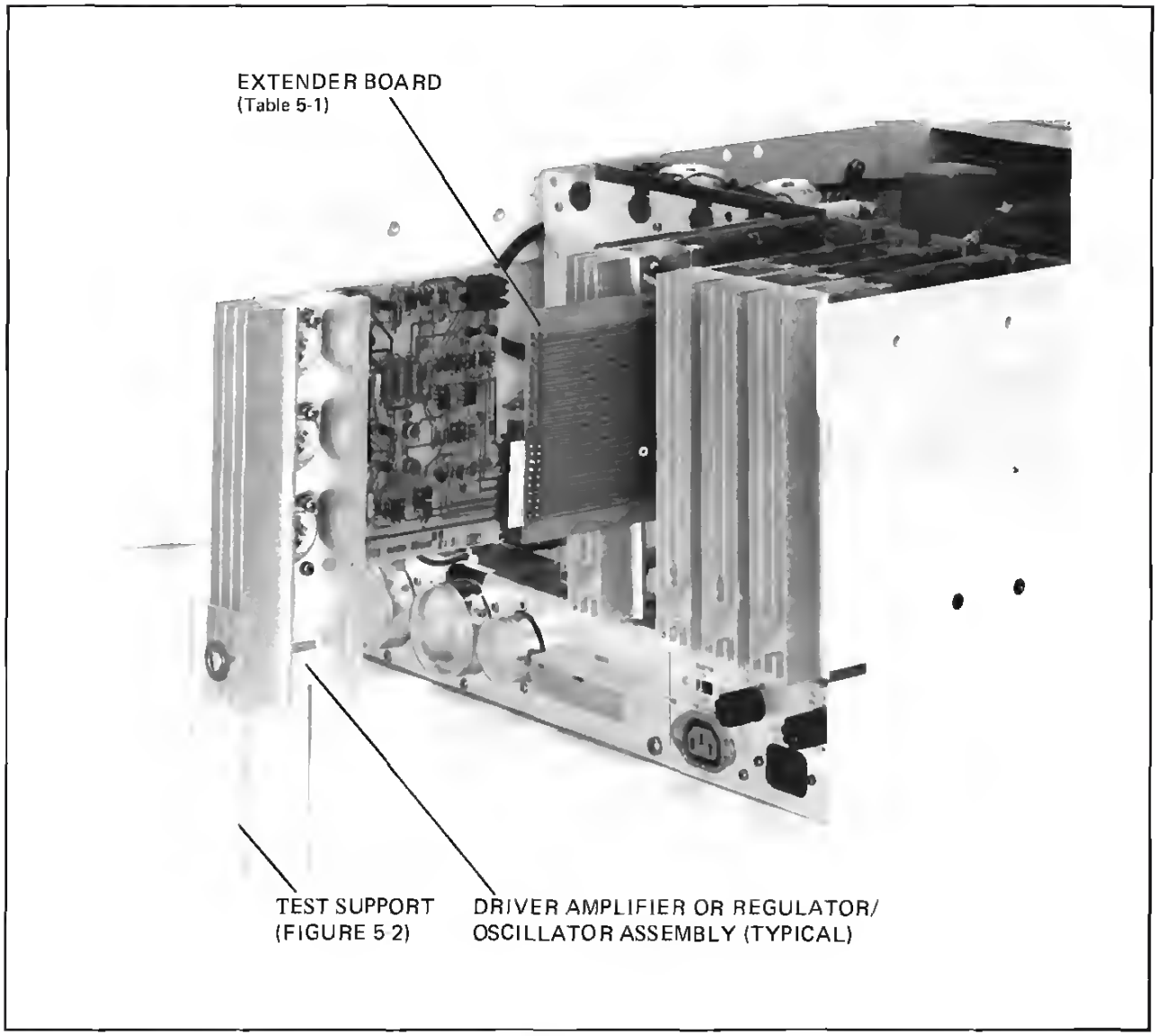


*Figure 5-3. Driver Amplifier and Regulator/Oscillator Test*

b. Check the spacing of the timing marks with a millimeter scale. They should be 25 mm ± 1%. Check again at 100 MM/SEC and 5 MM/SEC speeds, allowing a maximum error of 1%.

Under certain humid conditions, if the paper brake is set too tightly, the paper will stretch slightly on the paper table, resulting in false timing.

**5-29. Stylus Adjustments.**

5-30. The stylus pressure, mechanical centering and parallax may be adjusted. Mechanical stops are adjusted as part of the electrical maintenance procedures, as is galvanometer sensitivity, but the galvanometer itself has no adjustments.

5-31. STYLUS PRESSURE ADJUSTMENT. Stylus pressure must be checked at the *tip* of the stylus only, for accurate readings. For access to the stylus tips, four holes are provided in the front top bar. See Figure 5-8 and proceed as follows:

a. Gain access to top of Recorder and remove painted metal cross bar cover to expose four holes for stylus pressure tester.

b. Run Recorder at 5 mm/sec. Hook tip of accessory Stylus Pressure Tester 14023A under edge of stylus under test.

c. Lift tester and stylus. When stylus stops writing,



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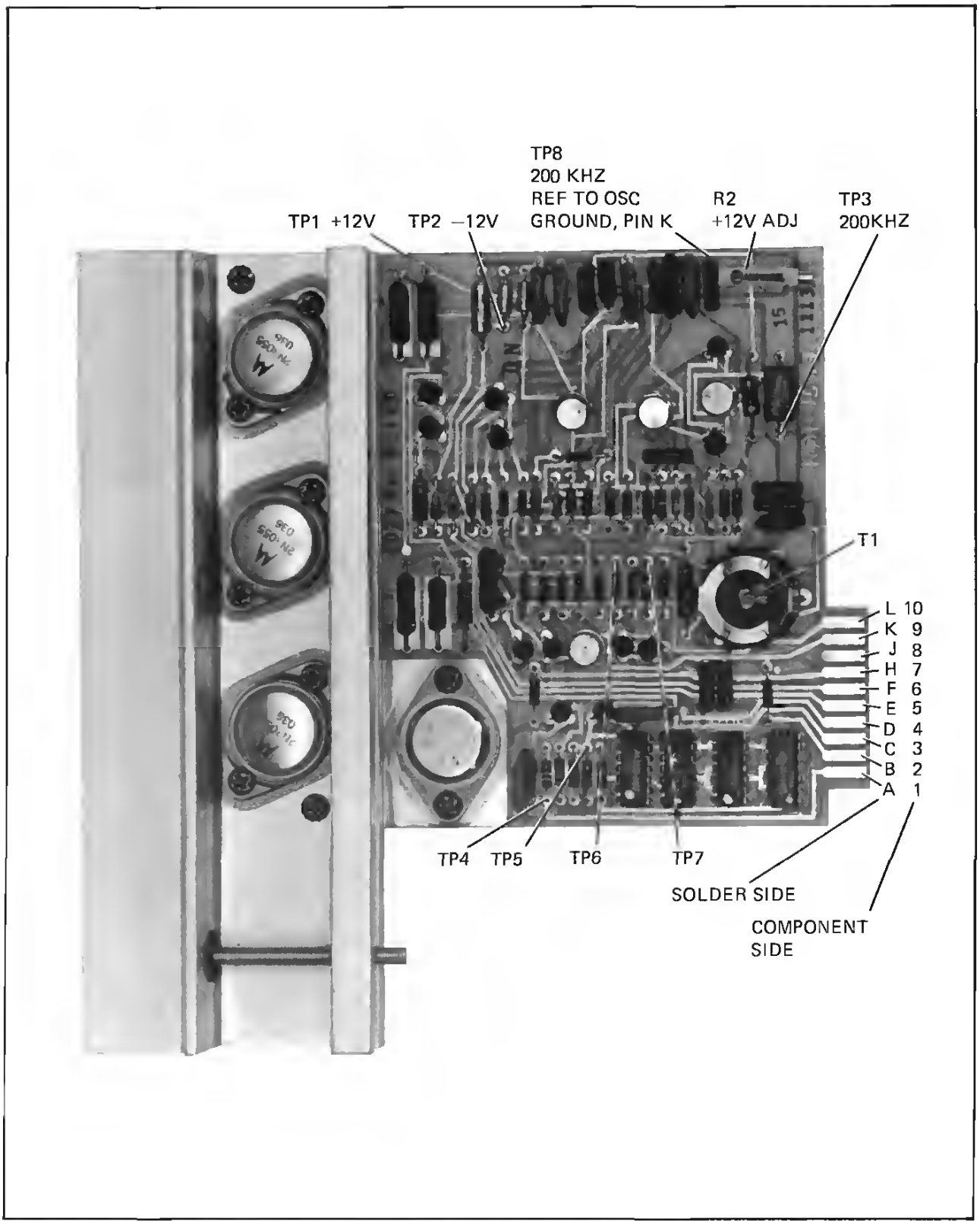


*Figure 5-4. Regulator/Oscillator Board Test Points*



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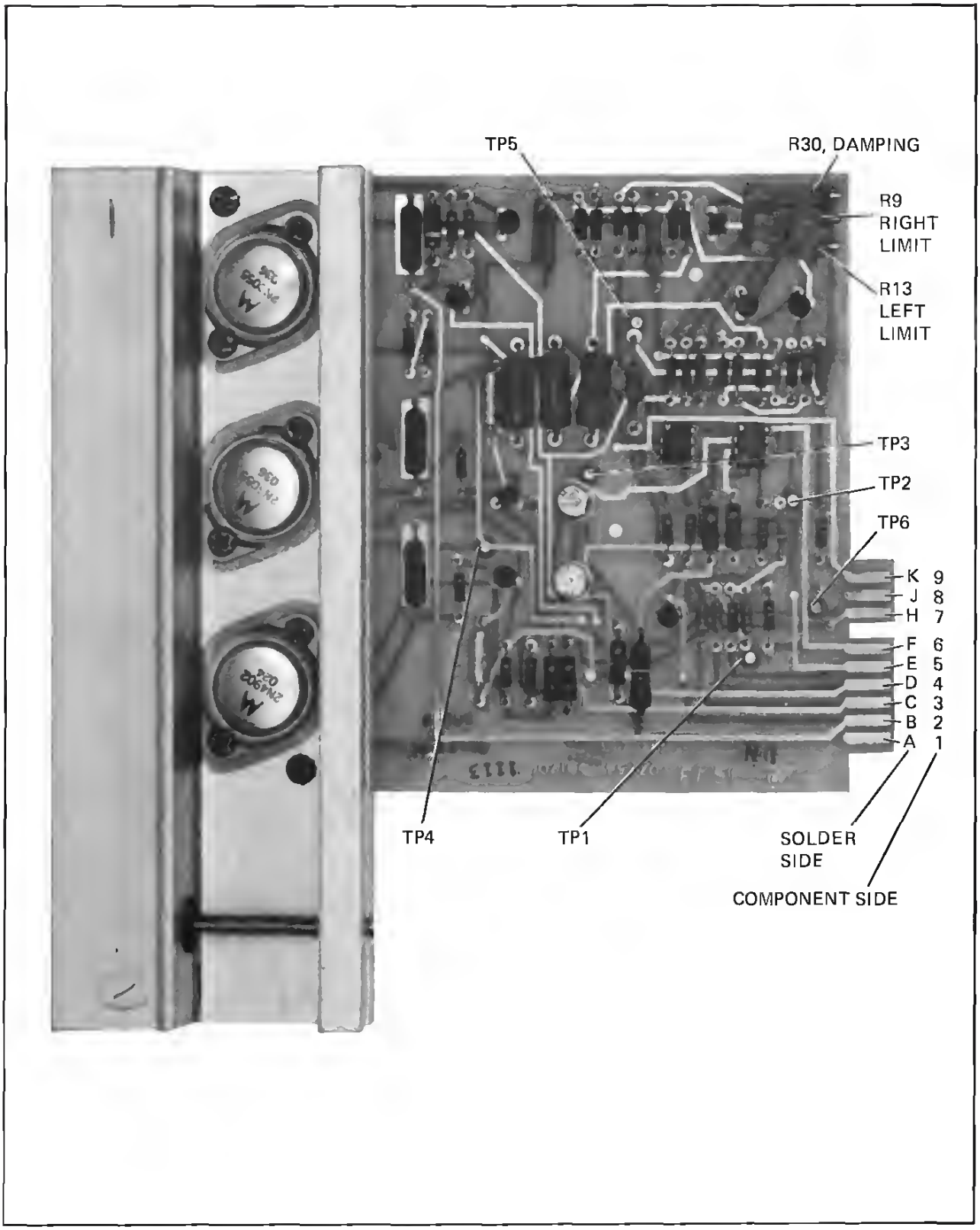


*Figure 5-5. Driver Amplifier Board Test Points*



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*Table 5-4 Paper Drive Troubleshooting*

| Trouble | Probable Cause | Solution and Paragraph |
|---|---|---|
| IMPROPER PAPER TRACKING (paper moves to one side or the other) | Worn brake felt or bent paper guide. Uneven tension on paper brake arm adjustment screws. | Replace worn part, 5-27. Establish even paper tension, slightly more on left side; Paragraph 5-24. |
| PAPER TEARS AT Z-FOLD | Excessive brake pad pressure. Also see next item. | Adjust both brake adjustment screws clockwise; 5-24. |
| PAPER JAMS IN PRESSURE ROLLER | One pressure roller spring is weaker than the other. | Replace both springs. |
| PAPER WEAVES FROM SIDE TO SIDE | Paper brake arm tension not adjusted or arm is dirty. Slick or dirty drive roll. | Establish slightly more pressure on left; 5-24. Clean or replace; 5-28. |
| IRREGULAR PAPER SPEED | Slick or dirty drive roll. | Clean or replace; 5-28. |
| INCORRECT PAPER SPEED | Solenoid wires to Transfer Board loose or misconnected. Solenoid coil or lead open. | Check for bad connections, open solenoid coils, leads. |
| NO PAPER DRIVE | Defective drive motor. | Check drive motor fuse and cable from power supply. |
| NO SIGNAL ON PAPER | Galvanometer circuit problem. CAUTION. GALVANOMETER IS NOT FIELD REPAIRABLE. REPLACE ONLY PARTS SHOWN IN FIGURE 6-18. | Refer to Table 5-3 for Driver troubleshooting, and see Paragraphs 5-29 to 5-34 for galvanometer adjustments. |

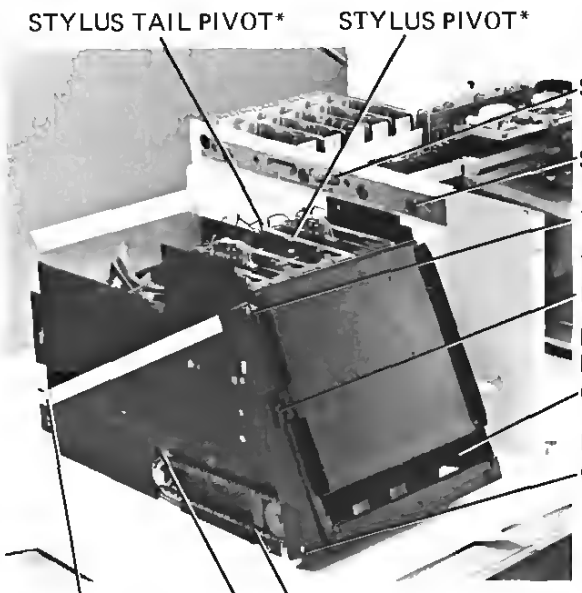


*Figure 5-6. Recorder Lubrication Points*



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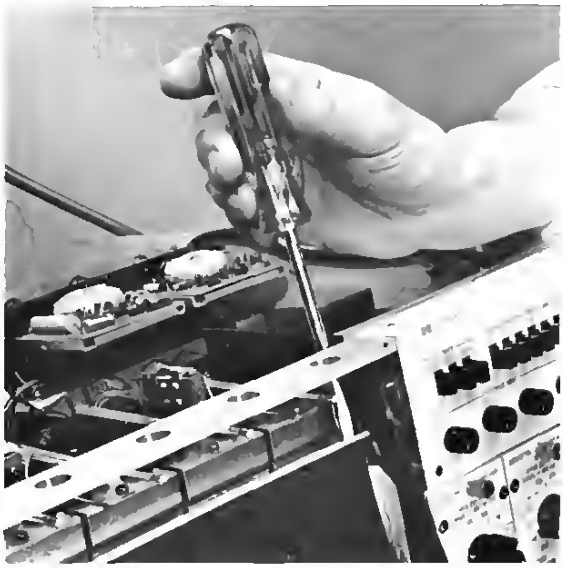
REMOVING FELT
STEP 1



REMOVING FELT
STEP 2

REPLACING FELT

GALVANOMETER MOUNTING
SCREW ACCESS HOLES (4)

*Figure 5-7. Paper Brake Felt Cover Removal and Replacement*



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tester should read 20 grams, ±2 grams. Read tester with respect to top of fluted ring (Figure 5-8).

d. If pressure adjustment is required, turn adjusting screw (Figure 5-8).

**CAUTION**

**DO NOT ATTEMPT TO BEND STYLUS.**

e. If stylus pressure cannot be adjusted, replace stylus (Paragraph 5-35), but only after observing whether stylus is properly mounted, and that pivot arm and retaining clip are locked on.

5-32. STYLUS CENTER ADJUSTMENT. Use the following procedure to center the writing stylus in its chart channel:

a. Run chart paper at 25 mm/sec to find correct position on table. Unplug galvanometer cable to permit true mechanical centering.

b. Loosen pivot arm clamp screw (Figure 5-10), but only enough so pivot arm moves on galvanometer upper suspension with a little resistance.

c. Position stylus on channel mechanical center. Run chart paper to check stylus position, and correct if necessary.

d. Slide pivot arm so its upper surface is flush with top of upper coil shaft (Figure 5-10). Tighten pivot arm clamp screw firmly.

**CAUTION**

**USE A SHARP-CORNERED ALLEN WRENCH THAT WILL STAY IN SET SCREW HOLE WITHOUT APPLYING SIDE PRESSURE. DO NOT APPLY EXCESSIVE SIDE PRESSURE.**

e. Reconnect galvanometer cable to transfer board assembly.

5-33. STYLUS PARALLAX ADJUSTMENT. When the stylus has proper parallax, the tail pivot and the stylus tip are on the same line as the chart channel centerline, with the result that square waves drawn by the stylus are exactly parallel to the chart time lines. To adjust the stylus parallax:

a. Loosen two screws indicated in Figure 5-8 and move stylus tail pivot into proper position. Tighten both screws snug but not tight.

b. Test for parallax by moving stylus gently with finger pressure, upscale and downscale, and observing whether stylus markings are parallel to time lines, ±0.1 mm across width of each channel.

c. When adjustment is complete, tighten tail pivot screws.

5-34. CHANNEL TIME SYNCHRONIZATION. When all channels are synchronized with respect to time, all styli fall on the same time line of the recording chart, ±0.25 mm over the width of the entire recording chart. Stylus parallax may have to be readjusted (Paragraph 5-33) after synchronizing channels since galvanometer adjusting screws may have some side play. If necessary, the galvanometers can be lined up as follows.

a. Remove chart paper.

b. With a long Pozidriv screwdriver, loosen 2 galvanometer hold-down screws in each misaligned channel just enough so galvanometer can be moved with adjustment screw (Figure 5-9).

c. Adjust with adjustment screws until traces all fall on same time line. This adjustment is by trial and error since chart paper will interfere witb adjustment.

5-35. STYLUS REMOVAL AND REPLACEMENT. The stylus is attached to the galvanometer pivot arm with a sliding retainer.

**CAUTION**

**CONSIDERABLE CAUTION IS REQUIRED IN REMOVING STYLUS SINCE IT IS EASILY BENT IN VERTICAL PLANE ALTHOUGH IT IS EXTREMELY STIFF HORIZONTALLY.**

To remove the stylus, perform the following procedure (Figure 5-10):

a. Using long nosed pliers and *obtaining some leverage to limit travel of the pull*, remove two heater wires from pins on galvanometer.

b. Push retaining clip on pivot arm forward, toward Recorder front, as shown.

c. Grip stylus between center attaching pin and tail pivot.

d. Carefully lift stylus free of pivot arm and tail pivot while rocking stylus from side to side.



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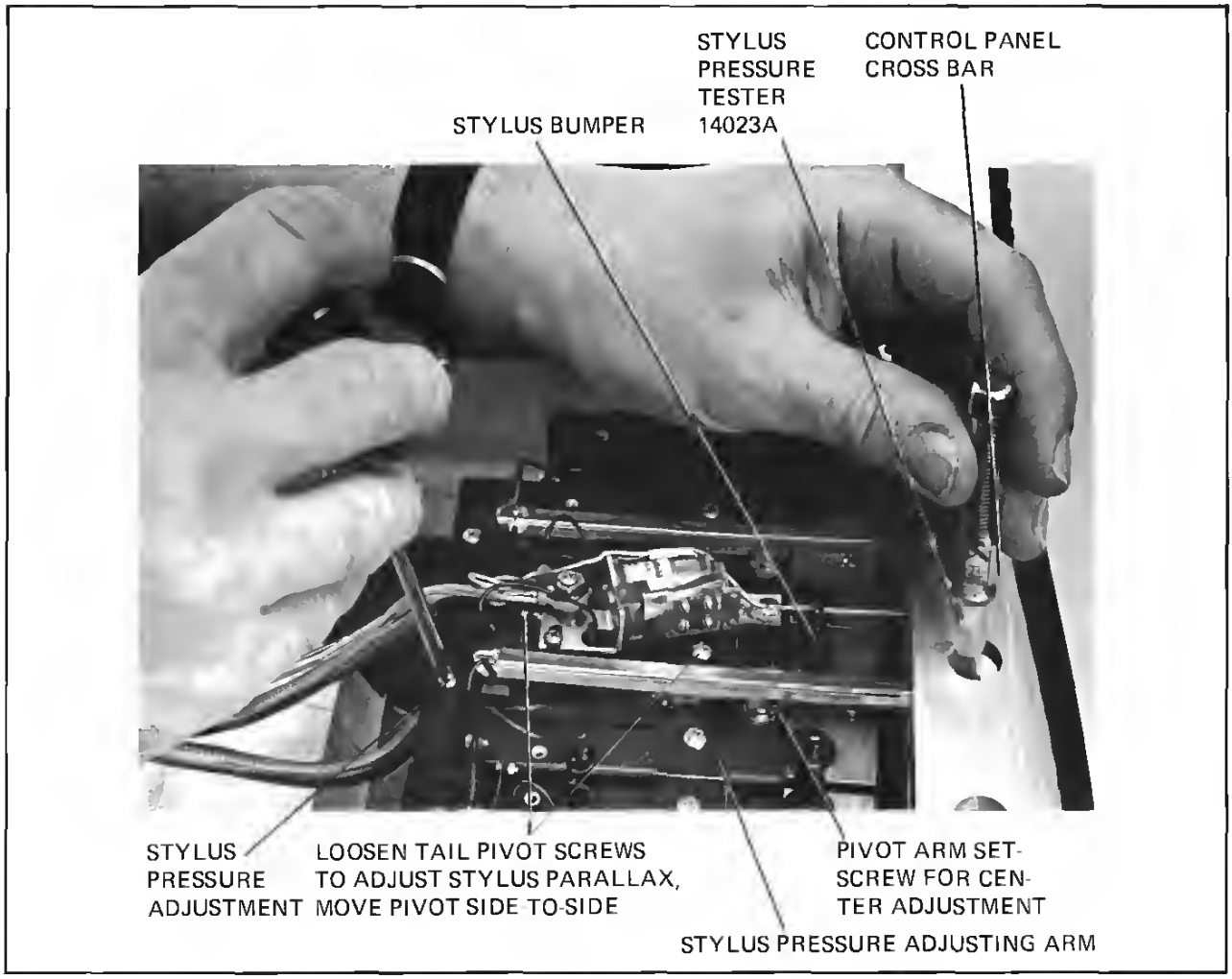
STYLUS PRESSURE TESTER 14023A
CONTROL PANEL CROSS BAR
STYLUS BUMPER
STYLUS PRESSURE ADJUSTMENT
LOOSEN TAIL PIVOT SCREWS TO ADJUST STYLUS PARALLAX, MOVE PIVOT SIDE TO-SIDE
PIVOT ARM SET-SCREW FOR CEN-TER ADJUSTMENT
STYLUS PRESSURE ADJUSTING ARM

*Figure 5-8. Stylus Adjustments*

5-36. After stylus replacement, the tip of the new stylus must be made to conform with the exact angle of the paper surface. This angle varies slightly from stylus to stylus. Styli therefore should never be replaced without lapping.

NOTE: The new stylus tip should be on the same time line as the other styli, ± 0.25 mm, otherwise adjust channel time synchronization, Paragraph 5-34.

5-37. STYLUS LAPPING. A new or replacement stylus must be lapped so it will have a uniform trace width as it moves across the paper.

a. Connect 30 Hz sine wave signal to input of channel. Run recorder at .25 mm/sec speed, and adjust signal amplitude for about 10 divisions deflection. Stop recorder.

b. Place a piece of lapping paper (07850-01520) under stylus tip so it spans center 10 divisions. Hold lapping paper with one finger on each side of stylus so paper is exactly flat. (Figure 5-11.)

c. Run recorder at .25 mm/sec, slowly moving paper under the stylus tip. Lapping time should be about 15 seconds. Turn off recorder and remove lapping paper.

d. Lapping is complete when stylus leaves uniform trace across entire channel width. Check stylus pressure, as described in Paragraph 5-31. *Do not lap excessively since the stylus tip is tapered and will leave a progressively wider trace.*

**5-38. CORRECTIVE MAINTENANCE.**

5-39. Instructions for removing and replacing Power Supply Assembly A3 and Driver Amplifier Assemblies A4, A5, A6



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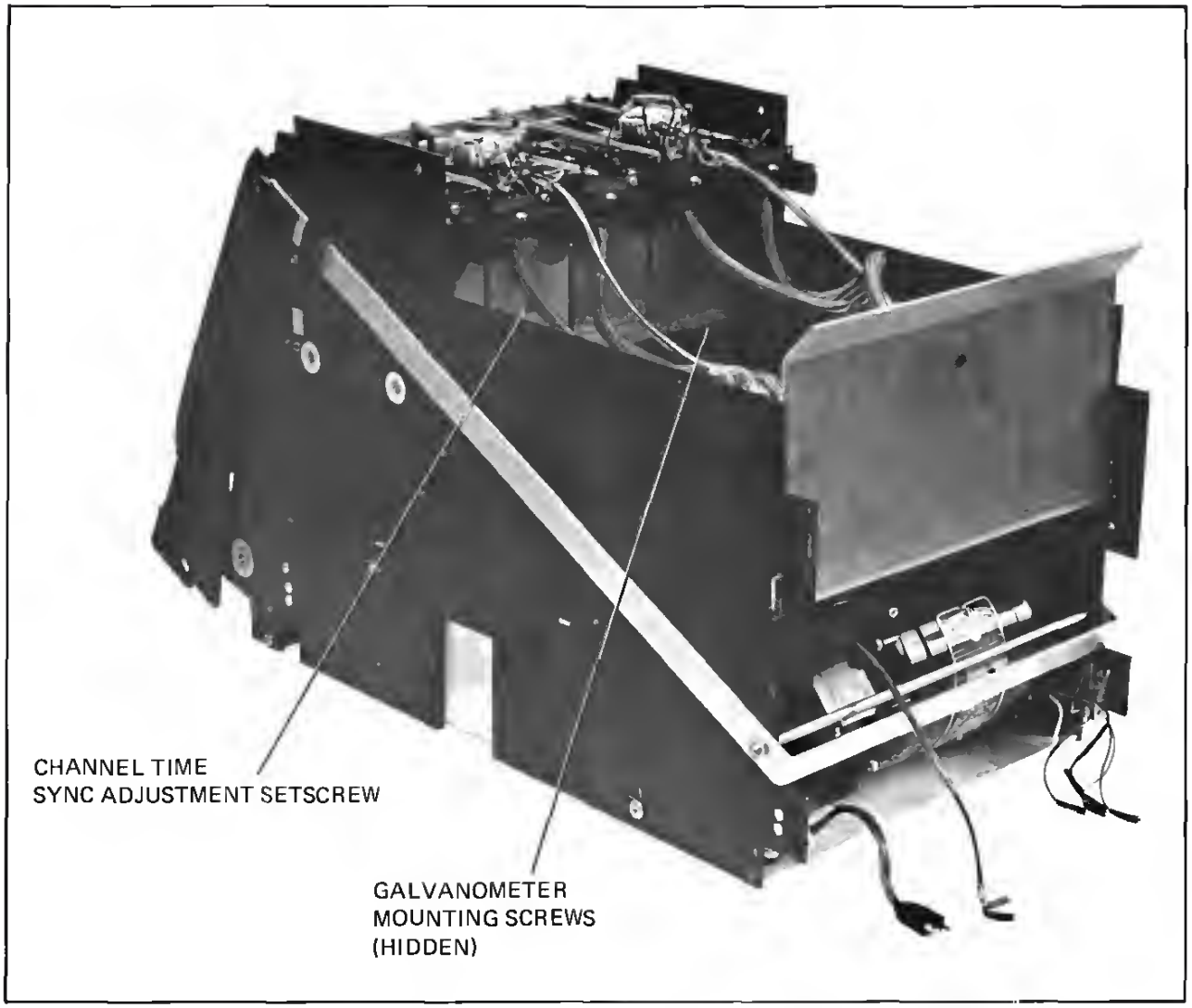


*Figure 5-9. Channel Time Synchronization Adjustment*

and A7 are given in the electrical performance test in Table 5-3. Corrective maintenance procedures cover:
Galvanometer Removal and Replacement
Drive Unit Removal and Replacement
Paper Table Removal and Replacement
Gearbox Removal, Lubrication and Replacement
Marker Assembly and Adjustment

**5-40. Galvanometer Removal and Replacement.**

5-41. To remove a Galvanometer, perform the following procedure:

a. Remove any marker assemblies attached to Galvanometer, following procedures in Paragraph 5-57.

b. Remove galvanometer cable W1 from PC edge connector on Transfer Board Assembly.

c. Pull out paper table at bottom, open fully.

d. Remove pack of paper from feed tray.

e. Remove stylus from Galvanometer (Paragraph 5-35).

f. Pass a screwdriver up through galvanometer mounting screw access holes (Figures 5-7, 5-12) and unfasten two galvanometer mounting screws (Figure 5-9). Do not change timing sync setscrew adjustment.

g. Carefully lift Galvanometer free of mounting.

5-42. Replacement of the Galvanometer is the reverse of the removal procedure. Always check the Galvanometer synchronization (position) with respect to the chart timing



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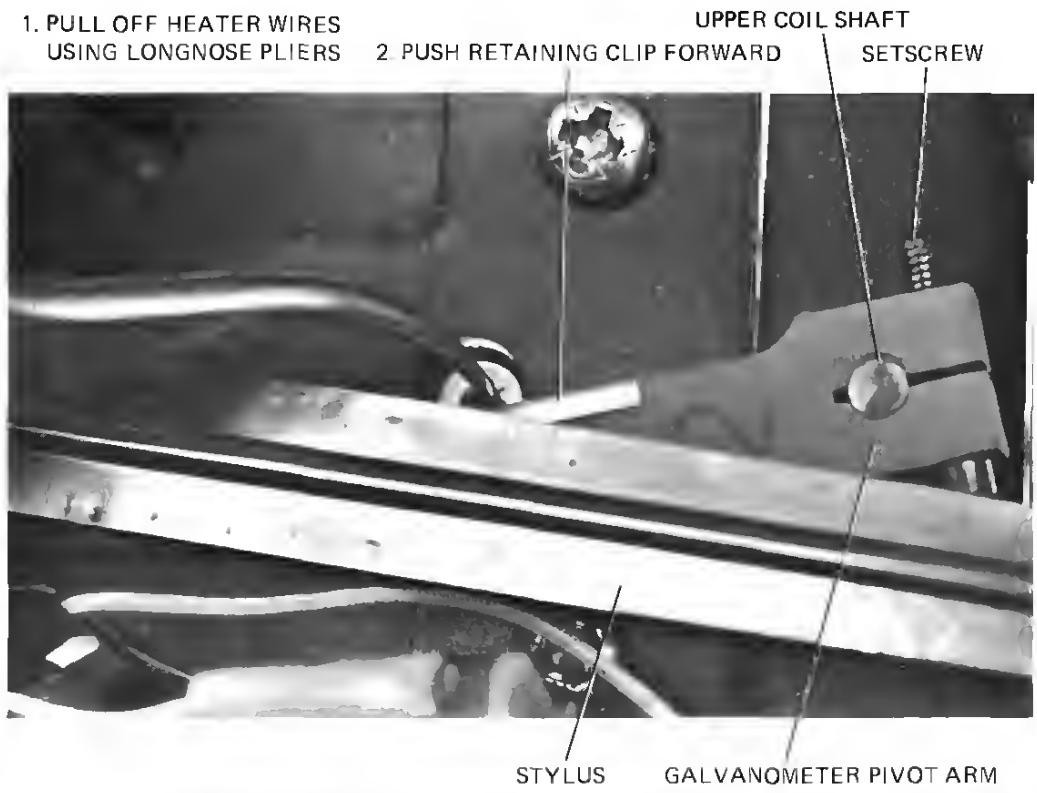
1. PULL OFF HEATER WIRES USING LONGNOSE PLIERS
2. PUSH RETAINING CLIP FORWARD
UPPER COIL SHAFT
SETSCREW
STYLUS
GALVANOMETER PIVOT ARM
3. GRIP STYLUS BETWEEN PIVOT PIN AND TAIL PIVOT AND WHILE ROCKING STYLUS FROM SIDE TO SIDE, LIFT GENTLY, STRAIGHT UP
4. CAREFULLY LIFT STYLUS FREE OF TAIL PIVOT

*Figure 5-10. Stylus Removal and Replacement*



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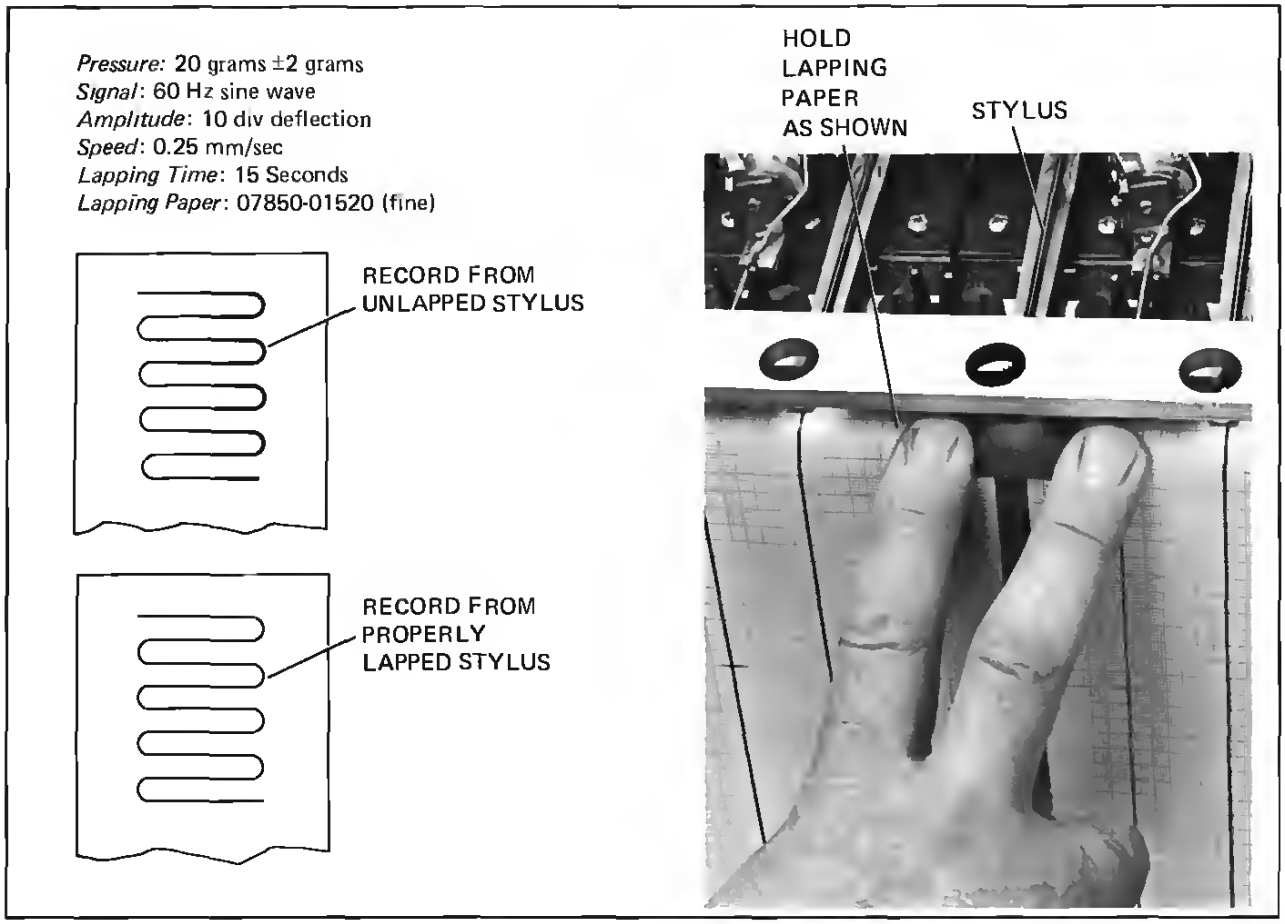
*Pressure*: 20 grams ±2 grams
*Signal*: 60 Hz sine wave
*Amplitude*: 10 div deflection
*Speed*: 0.25 mm/sec
*Lapping Time*: 15 Seconds
*Lapping Paper*: 07850-01520 (fine)
RECORD FROM UNLAPPED STYLUS
RECORD FROM PROPERLY LAPPED STYLUS
HOLD LAPPING PAPER AS SHOWN
STYLUS

*Figure 5-11. Stylus Lapping Procedure*

lines (Timing Sync, Paragraph 5-15, part d) after replacement. Faulty parallax may be corrected with the time synchronization procedure in Paragraph 5-34.

**5-43. Drive Unit Removal and Replacement.**

5-44. The Drive Unit can be removed from the main chassis for maintenance. It is not necessary to remove the drive unit to gain access to the gearbox or galvanometer assemblies, which can be removed separately. To remove the Drive Unit, first remove the Recorder from the Case (Figure 2-11). To remove it from the Case, unfasten the screws shown and lift out the Recorder. The Recorder need not be removed from the Cabinet or the Cart, but a table should be placed under the drive unit before the drive unit is removed.

**CAUTION**

**TO PREVENT ACCIDENTALLY UNBALANCING THE RECORDER, ALWAYS TIP IT ONTO THE HEAVY SIDE THAT CONTAINS THE DRIVE UNIT.**

a. Tip the Recorder onto its left side (facing the front panel).

b. Refer to Figure 5-12 and disconnect the drive motor plug and speed control wires (inset). Remove four screws from the front and rear bottom cross bars. Two typical screws are shown in the illustration.

c. Carefully return the Recorder to a level position, on a flat surface.

d. Remove the control switch cover bracket and the control panel cross bar (Figure 5-8). Unplug galvanometer, interlock and marker cables.

e. Remove one flat-head Pozidriv screw from upper rear center portion of paper feed tray on Drive Unit (Figure 5-12, lower illustration).

f. Carefully lift the Drive Unit up and out of the main chassis (Unit Housing Assembly).



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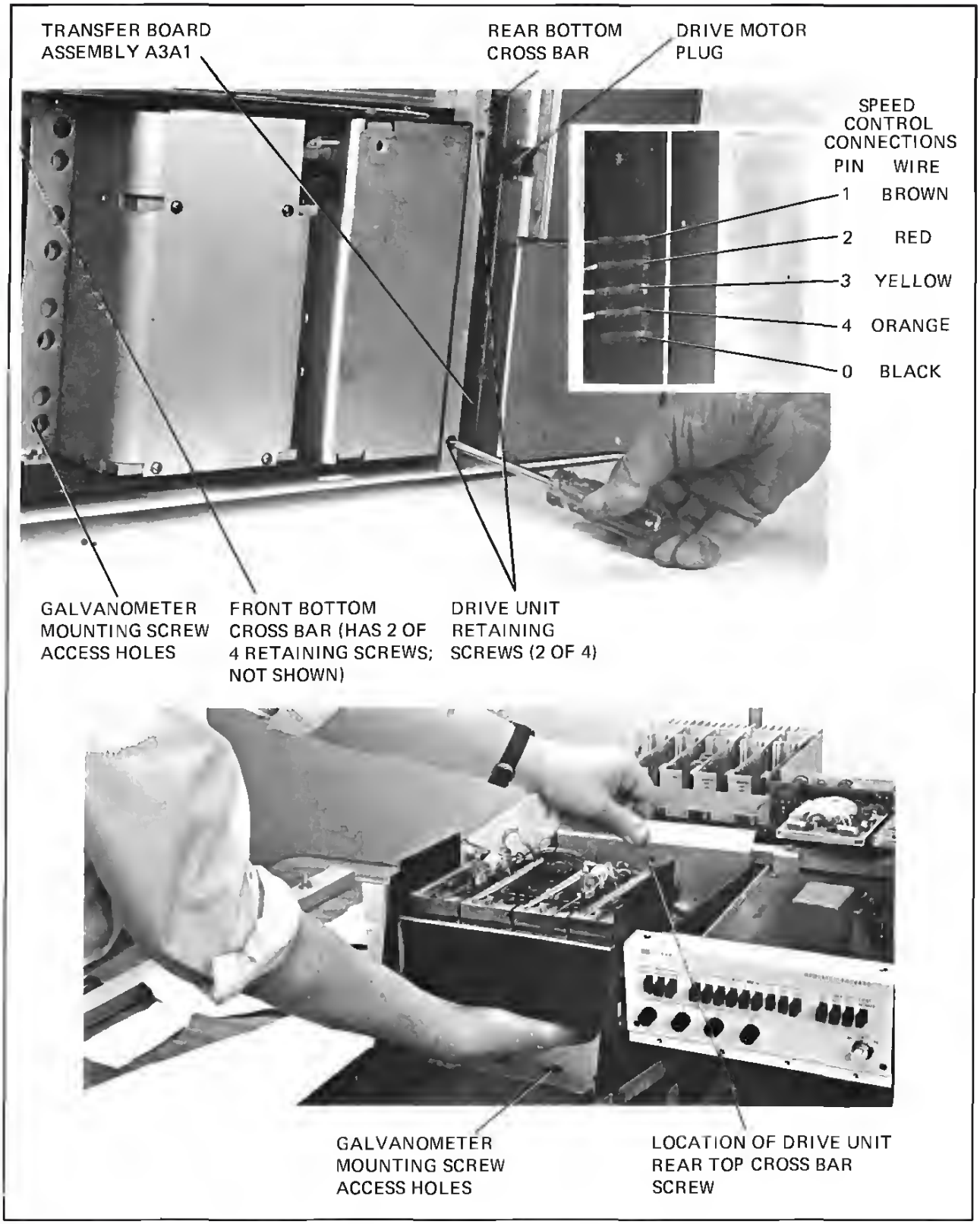
TRANSFER BOARD ASSEMBLY A3A1
REAR BOTTOM CROSS BAR
DRIVE MOTOR PLUG
SPEED CONTROL CONNECTIONS
PIN WIRE
1 BROWN
2 RED
3 YELLOW
4 ORANGE
0 BLACK
GALVANOMETER MOUNTING SCREW ACCESS HOLES
FRONT BOTTOM CROSS BAR (HAS 2 OF 4 RETAINING SCREWS; NOT SHOWN)
DRIVE UNIT RETAINING SCREWS (2 OF 4)
GALVANOMETER MOUNTING SCREW ACCESS HOLES
LOCATION OF DRIVE UNIT REAR TOP CROSS BAR SCREW

*Figure 5-12. Drive Unit Removal*



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5-45. Reinstallation of the Drive Unit is the reverse of the removal procedure.

**5-46. Paper Table Disassembly for Drive Roller Replacement.**

5-47. The Drive Unit must be removed from the Recorder if the paper table is to be disassembled, to gain access to the drive roller if it is to be replaced. To disassemble the paper table, proceed as follows:

a. Pull out the paper table at the bottom and lower it to a horizontal position (Figure 5-13).

b. Remove two flat head screws that mount paper guide plate through a strip nut (bar of metal with two tapped holes) at back of paper table (Figure 5-13).

c. Remove paper guide plate.

d. Remove rod retainer exposed at upper right corner of table, slide pivot rod to left to disengage pivot arm.

e. Spring one of center table link pivots outward gently to disengage table from pivot rod.

f. Loosen 4 gearbox retaining screws to slacken drive chain on table sprocket.

g. Using small, flat-blade screwdriver, pry off snap ring holding sprocket to drive roller shaft (Figure 5-14). *Pry only at center of C-shaped ring*, as shown, using keyway for access to ring.

h. Remove sprocket gear and key from shaft.

i. Remove screw at bottom right edge of drive unit (Figure 5-15).

j. Spring drive unit side plate outward *with finger pressure only*, and pull table link and drive roller out as shown in Figure 5-15 (1, 2).

k. Remove bearing at each end of drive roller (3).

l. Remove right side of drive roller by springing table link outward (4) and pulling drive roller up and to right (5).

m. Reverse disassembly procedures to reassemble paper table.

NOTE: Paper interlock switch and wires may not be present in some units.

**5-48. Gearbox Removal and Overhaul.**

5-49. The gearbox may be removed for service without removing the drive unit from the main recorder chassis (unit housing assembly). To remove the gearbox, perform the following steps:

a. Remove all preamplifiers from preamplifier rack.

b. Remove speed control wires and motor cable from transfer board assembly (Figure 5-18 inset).

c. Remove four screws shown in Figure 5-16, as follows.

(1) Remove Screw A, located on the Drive Unit inside the preamplifier rack.

(2) Tip the Recorder up at the preamplifier side. Under the preamplifier rack, toward the rear, locate and remove Screw B from the Drive Unit.

(3) Remove Screw C through the Recorder side plate.

(4) Remove Screw D through the Recorder side plate.

d. The gearbox will drop away from the Drive Unit. If necessary, press in on the hex nut shown in Figure 5-16 to clear side plate.

e. Elevate the front of the Recorder with a wooden block about 3.5 inches (7 or 8 cm) high. Lift the output chain away from the output sprocket as shown in Figure 5-17. NOTE: The gearbox should be lubricated whenever the recorder is overhauled, in addition to the normal lubrication at 12 months or 2000 hours of operation at varying speeds. Under continued low speed operation, the gearbox should be lubricated every 6 months or 1000 hours. Whenever an extended period of recording is anticipated, that is, for 30, 60 or 90 days continuous duty, a lubrication and inspection before the recording period will help to assure uninterrupted service. For a list of the recommended lubricants, see Table 5-2.

5-50. GEARBOX INSPECTION. With the gearbox separated from the Drive Unit, set it up for test running. This test run is the same as the run-in performed after lubrication. Connect the motor cable and speed control cable to the Transfer Board Assembly with extender cables as shown in Figure 5-18. Remove the inspection plate to expose the gear train. Inspect for brass particles from the gears. If any are found, move the gears by hand and inspect the gear teeth for excessive wear or damage. Run the gearbox in all chart speeds (selected from the recorder control panel), and



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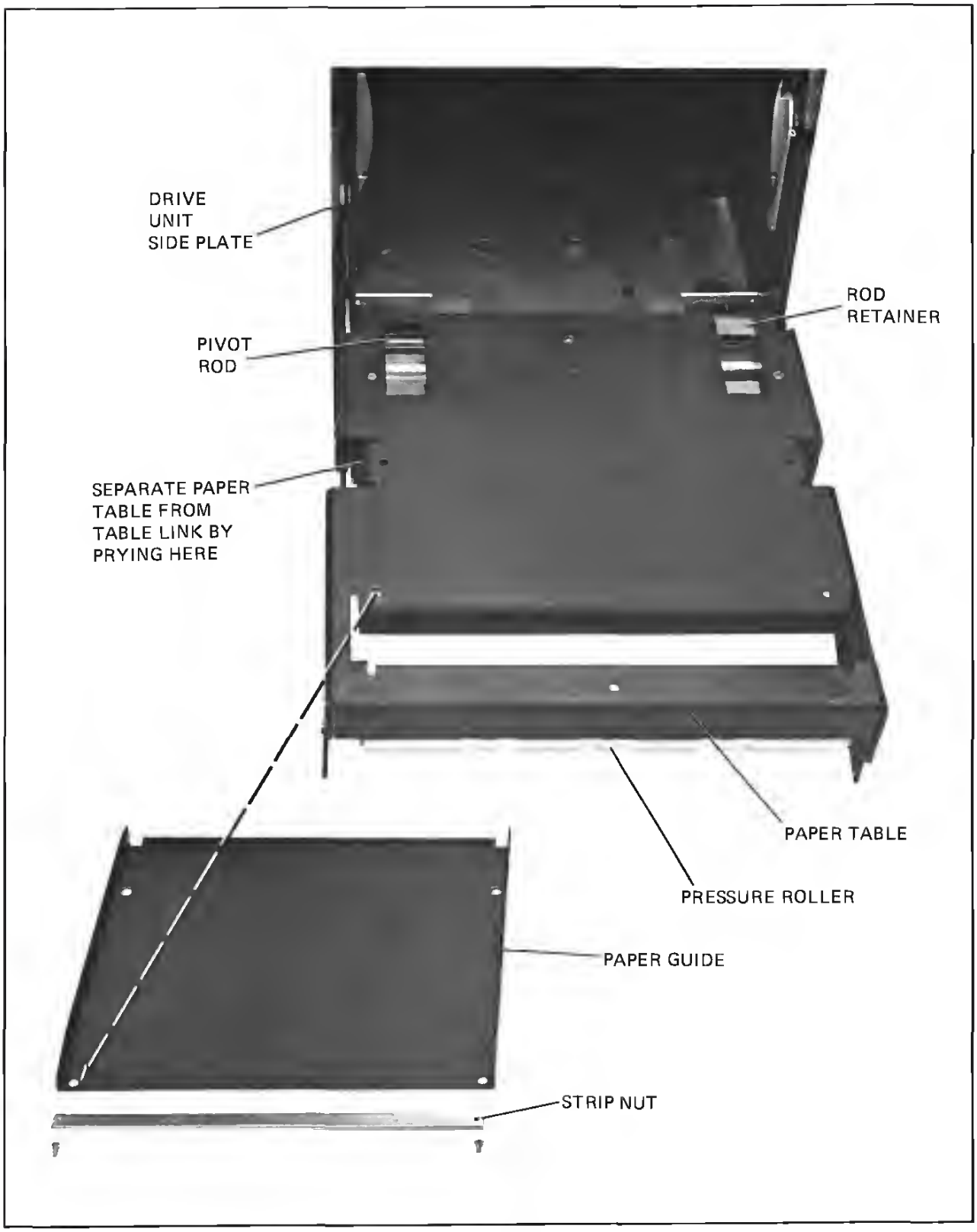


*Figure 5-13. Paper Table Removal*



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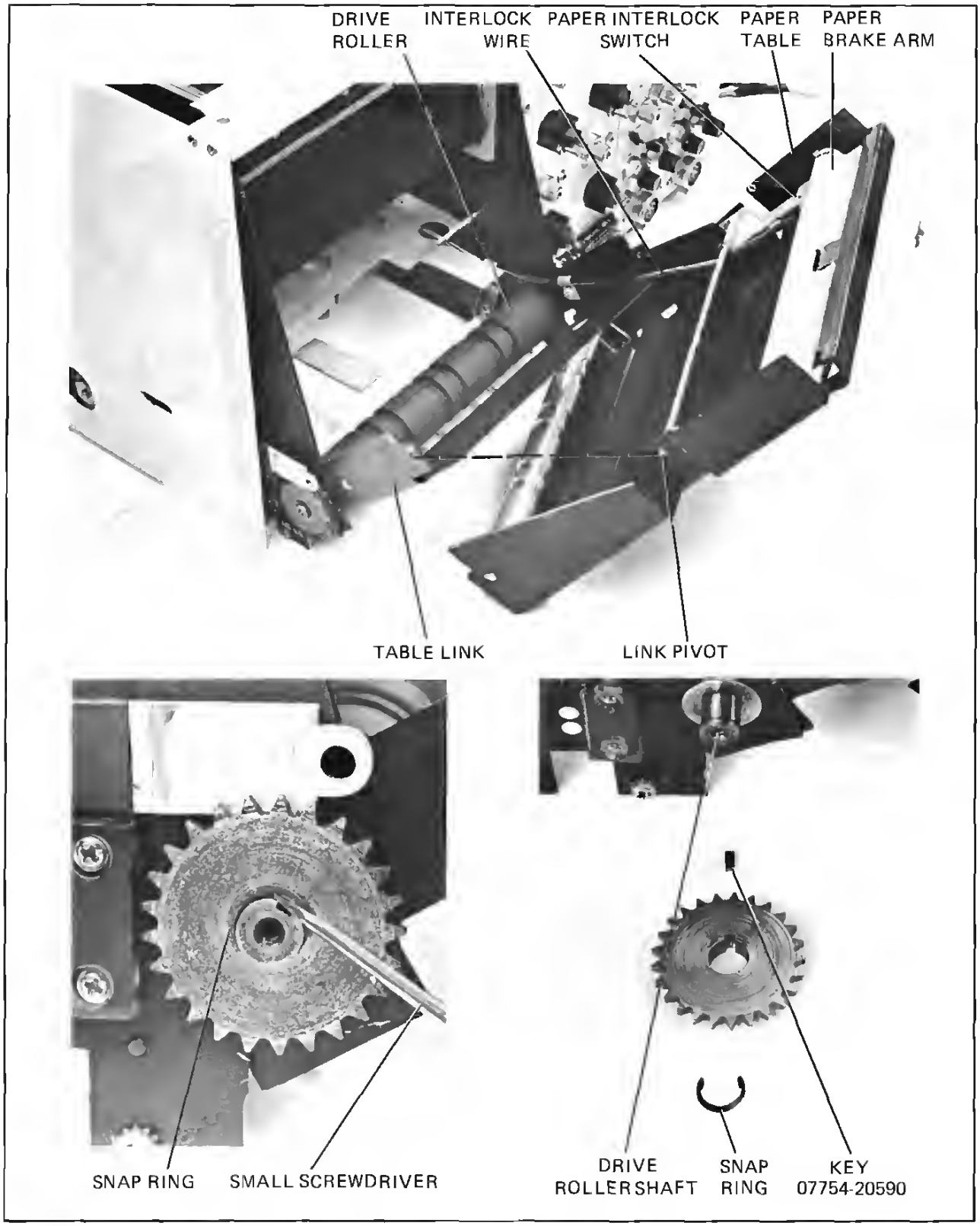


*Figure 5-14. Drive Roller and Table Link Removal (Part 1)*



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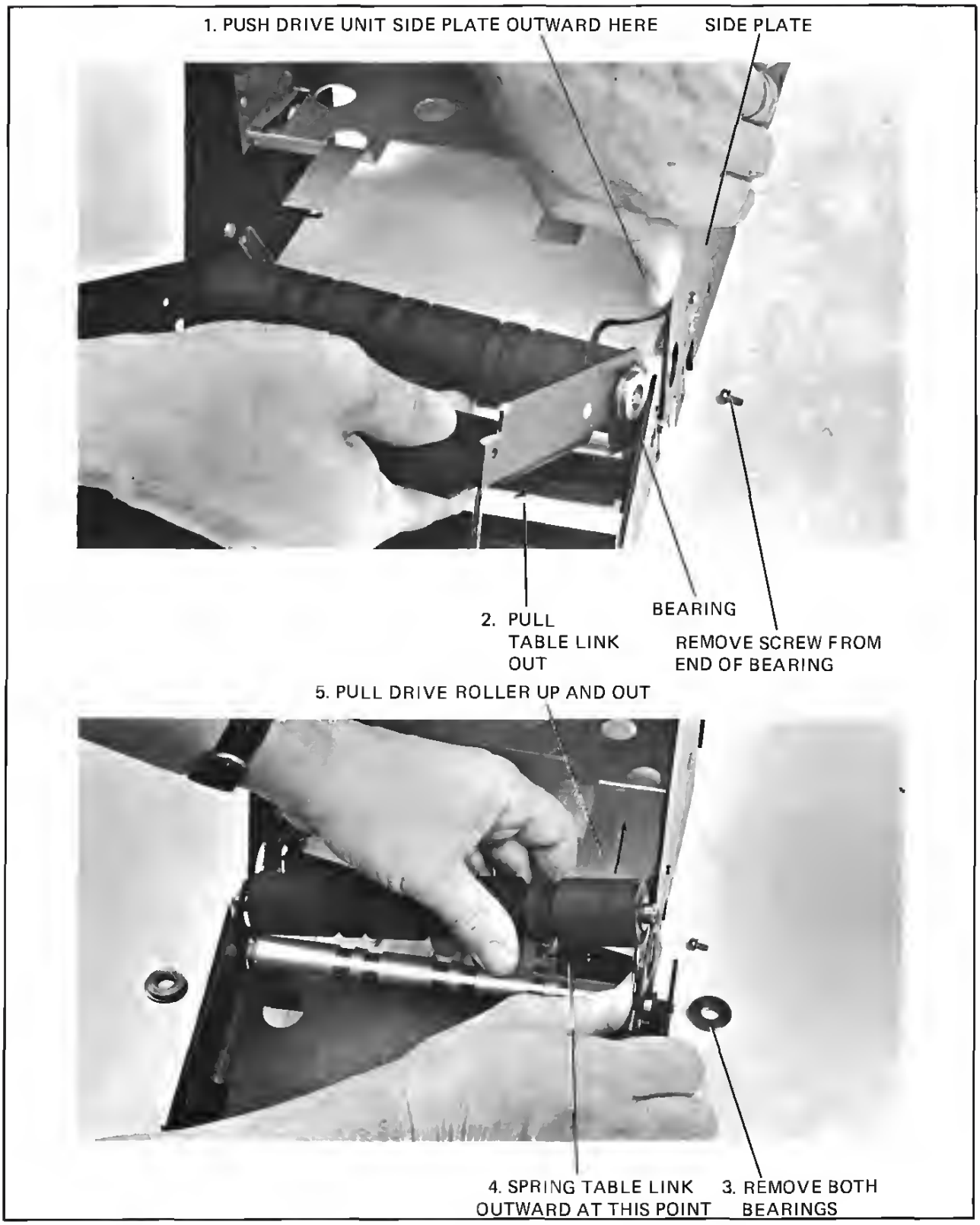
1. PUSH DRIVE UNIT SIDE PLATE OUTWARD HERE
SIDE PLATE
2. PULL TABLE LINK OUT
BEARING
REMOVE SCREW FROM END OF BEARING
5. PULL DRIVE ROLLER UP AND OUT
4. SPRING TABLE LINK OUTWARD AT THIS POINT
3. REMOVE BOTH BEARINGS

*Figure 5-15. Drive Roller and Table Link Removal (Part 2)*



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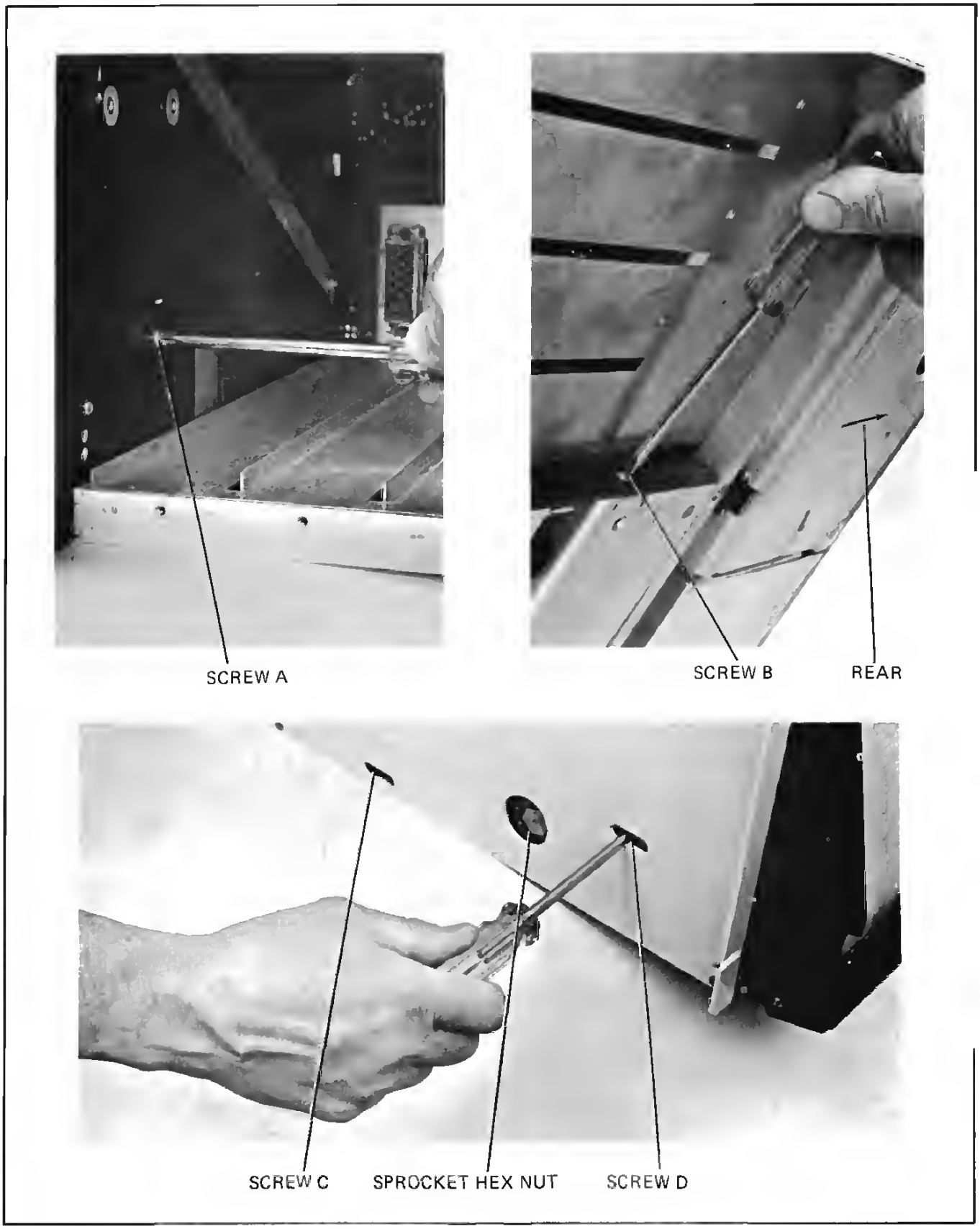


*Figure 5-16. Gearbox Removal*


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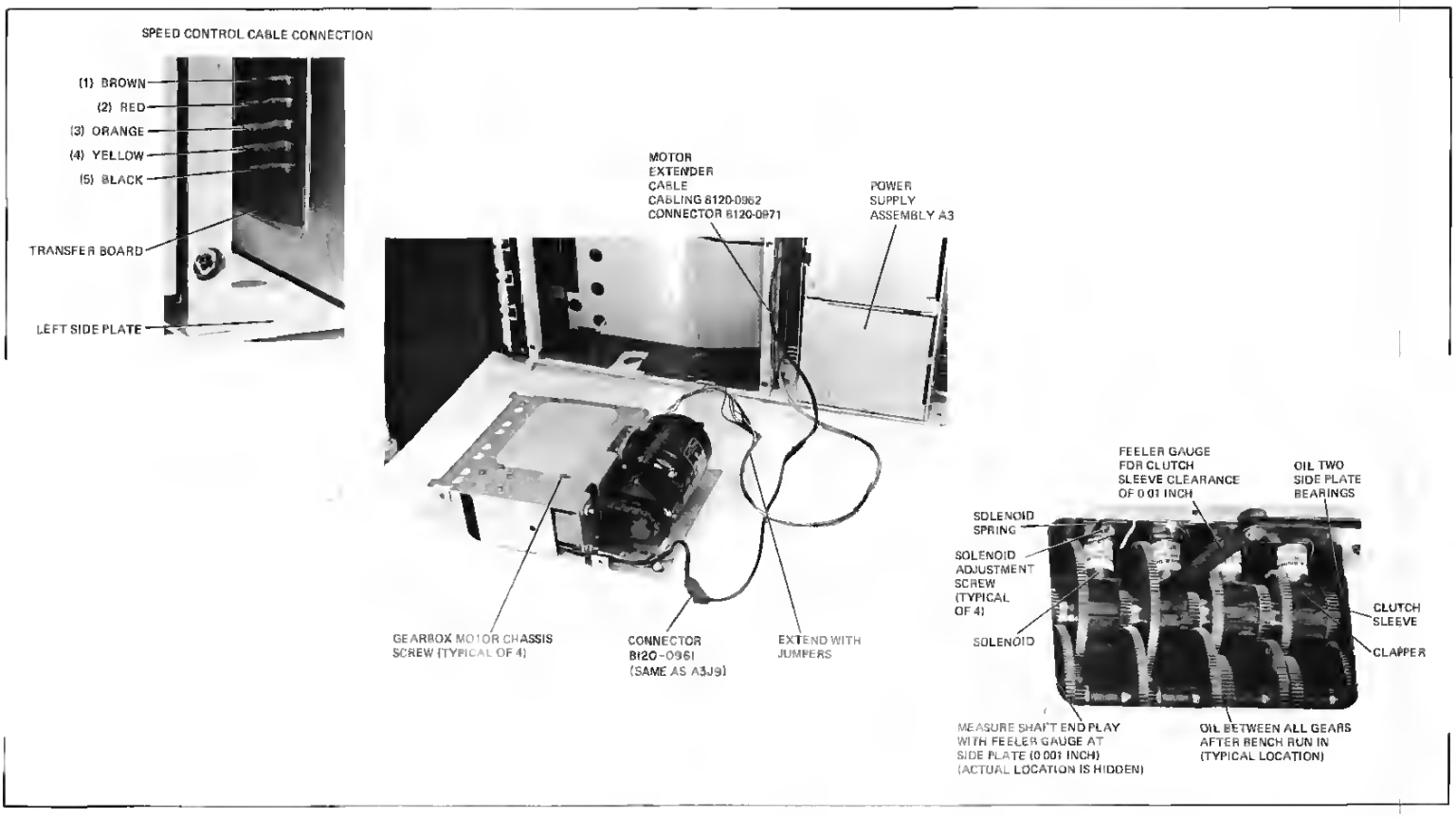
SPEED CONTROL CABLE CONNECTION
(1) BROWN
(2) RED
(3) ORANGE
(4) YELLOW
(5) BLACK
TRANSFER BOARD
LEFT SIDE PLATE
MOTOR EXTENDER CABLE CABLING 8120-0962 CONNECTOR 8120-0971
POWER SUPPLY ASSEMBLY A3
GEARBOX MOTOR CHASSIS SCREW (TYPICAL OF 4)
CONNECTOR 8120-0961 (SAME AS A3J9)
EXTEND WITH JUMPERS
FEELER GAUGE FOR CLUTCH SLEEVE CLEARANCE OF 0.01 INCH
OIL TWO SIDE PLATE BEARINGS
SOLENOID SPRING
SOLENOID ADJUSTMENT SCREW (TYPICAL OF 4)
SOLENOID
CLUTCH SLEEVE
CLAPPER
MEASURE SHAFT END PLAY WITH FEELER GAUGE AT SIDE PLATE (0.003 INCH) (ACTUAL LOCATION IS HIDDEN)
OIL BETWEEN ALL GEARS AFTER BENCH RUN IN (TYPICAL LOCATION)

*Figure 5-11. Gearbox Inspection and Solenoid Adjustment*

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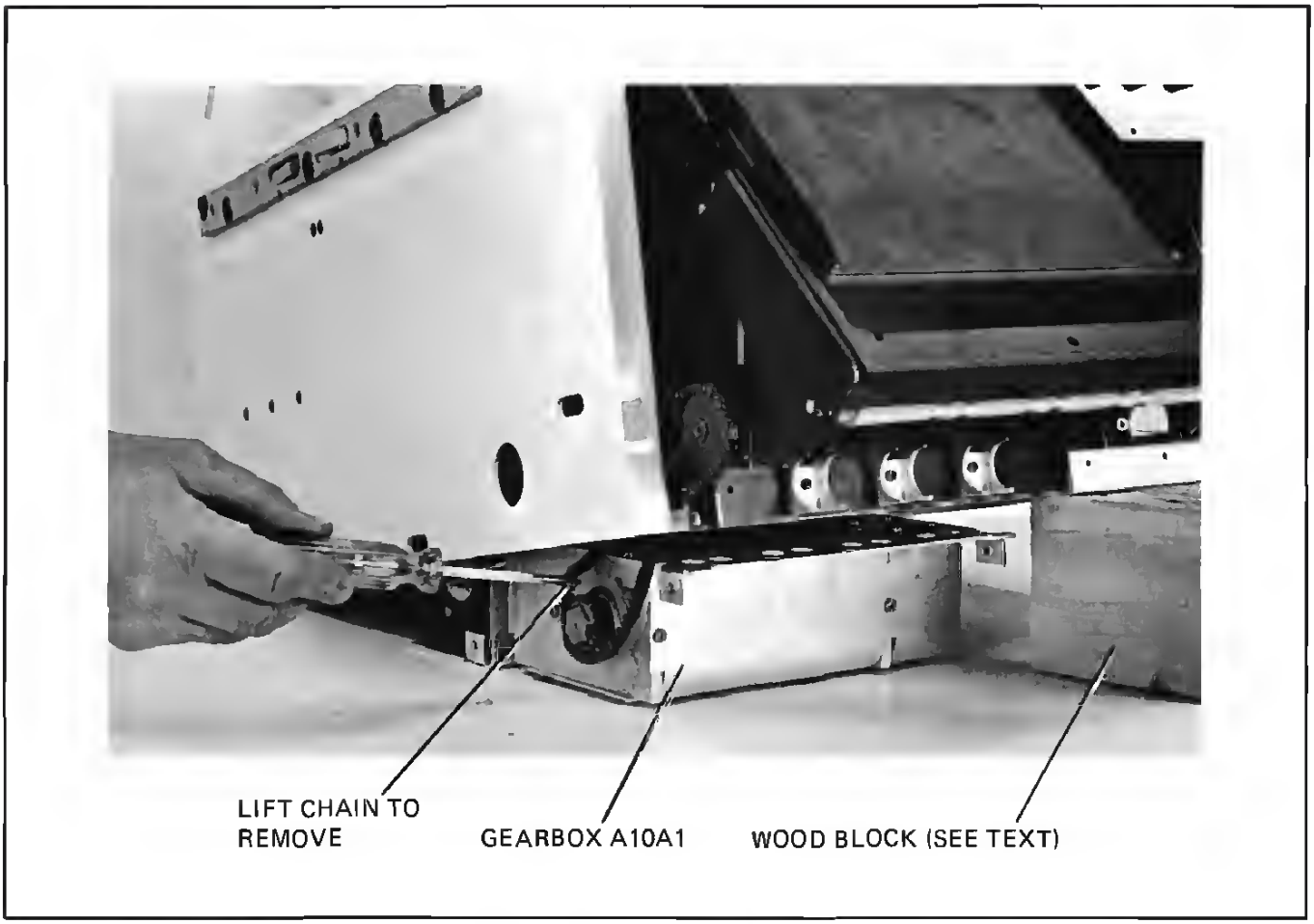


*Figure 5-17. Drive Chain Removal*

listen for chattering of clutch springs, which indicates either a need for lubrication or replacement of the clutch spring or replacement of a gear if the gear hub is worn. Parts that are obviously faulty, such as a twisted spring jamming the gearbox, should be replaced during overhaul.

5-51. GEARBOX DISASSEMBLY. Use the following procedure to disassemble the gearbox, and to inspect for clutch wear.

a. Remove four screws holding the motor chassis and drive motor (Figure 5-18).

b. Tip the chassis, toward the drive motor as shown in Figure 5-19, removing the chain, cover, and motor as a unit.

c. Turn the gearbox upside down and remove eight screws holding the bottom cover and solenoids.

d. Remove the bottom cover by lifting it upward (Figure 5-19).

NOTE: If gears are to be replaced or components lubricated, remove only one shaft at a time to preserve the order of the gears on the shaft for best wear characteristics.

e. Remove one screw holding the primary shaft to the end plate, and pull out the shaft by the large output gear (Figure 5-20). Lift the entire primary gear train out as one unit. Note the orientation and position of each component.

f. Remove the parts from the gear train one at a time, and clean each part by brushing it with Chlorothene solvent. Wipe plastic clutch sleeves with Chlorothene-dampened cloth.

**CAUTION**

**ALWAYS BRUSH NON-PLASTIC PARTS; NEVER IMMERSE THEM IN SOLVENT. DO NOT WASH PLASTIC CLUTCH SLEEVES WITH SOLVENT.**

g. Inspect each part for damage and wear before lubrication. To check for hub wear, drag a fingernail across hub surface and check for grooves.



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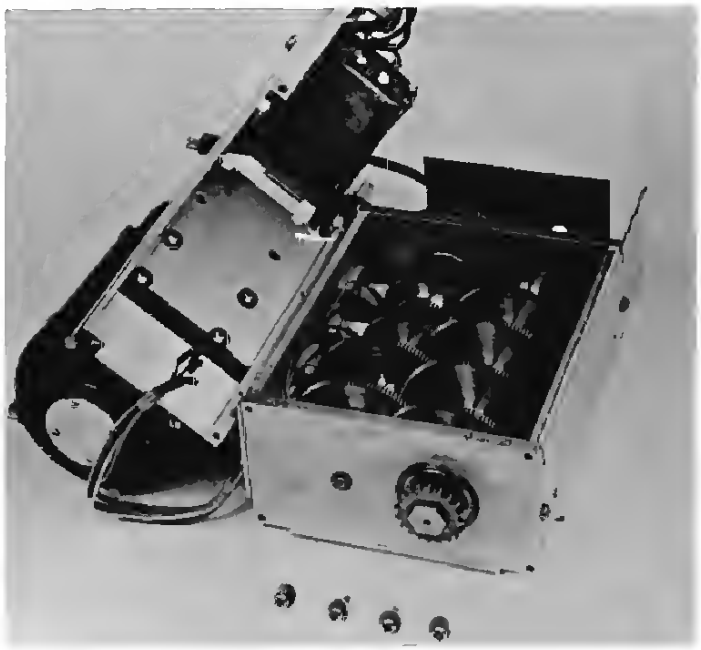
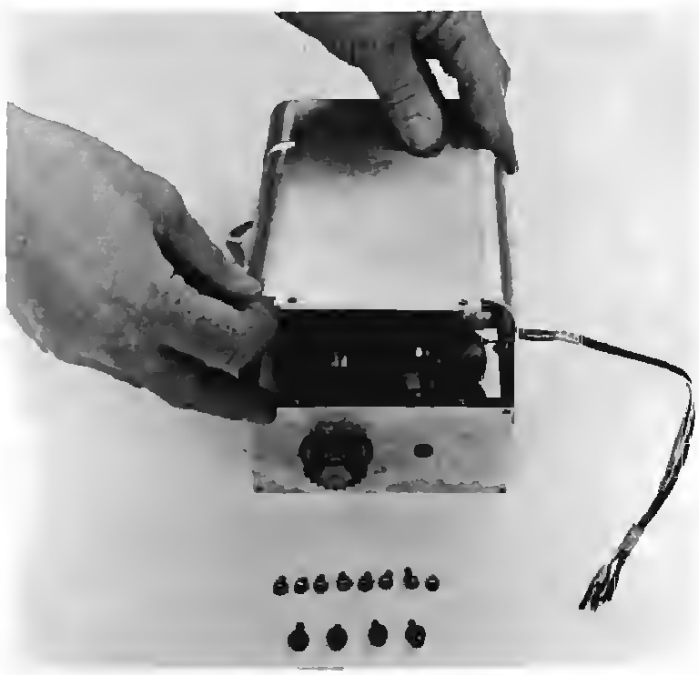
1. CHASSIS



REMOVING MOTOR CHASSIS

2.



REMOVING GEARBOX COVER

*Figure 5-19. Gearbox Cover Removal*

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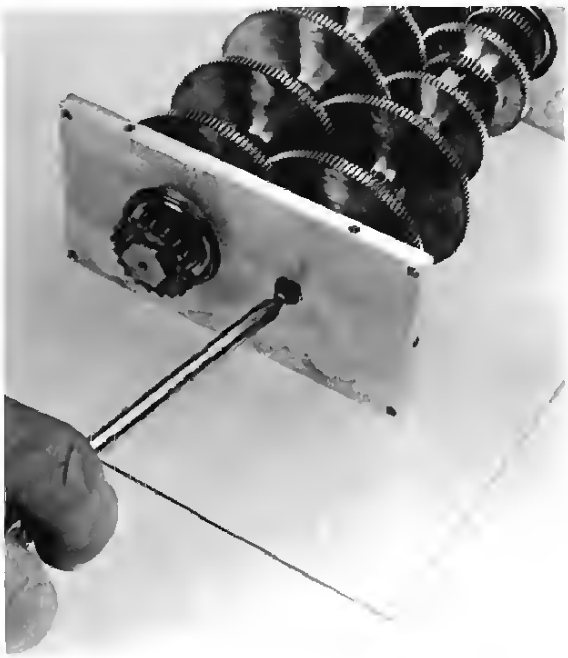
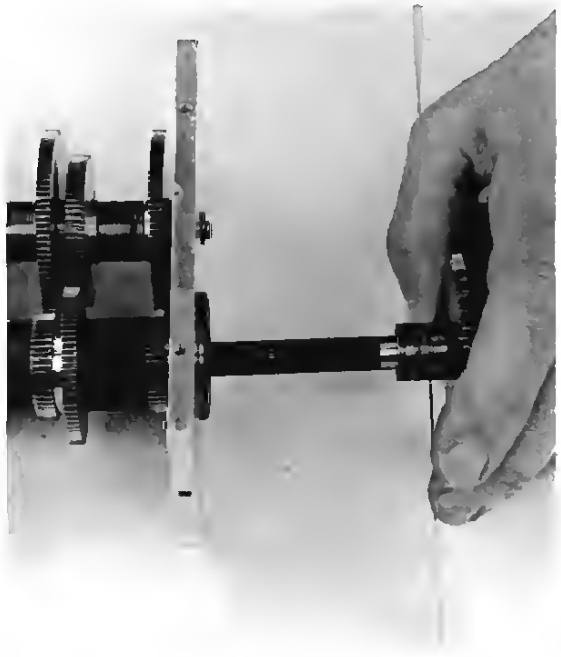
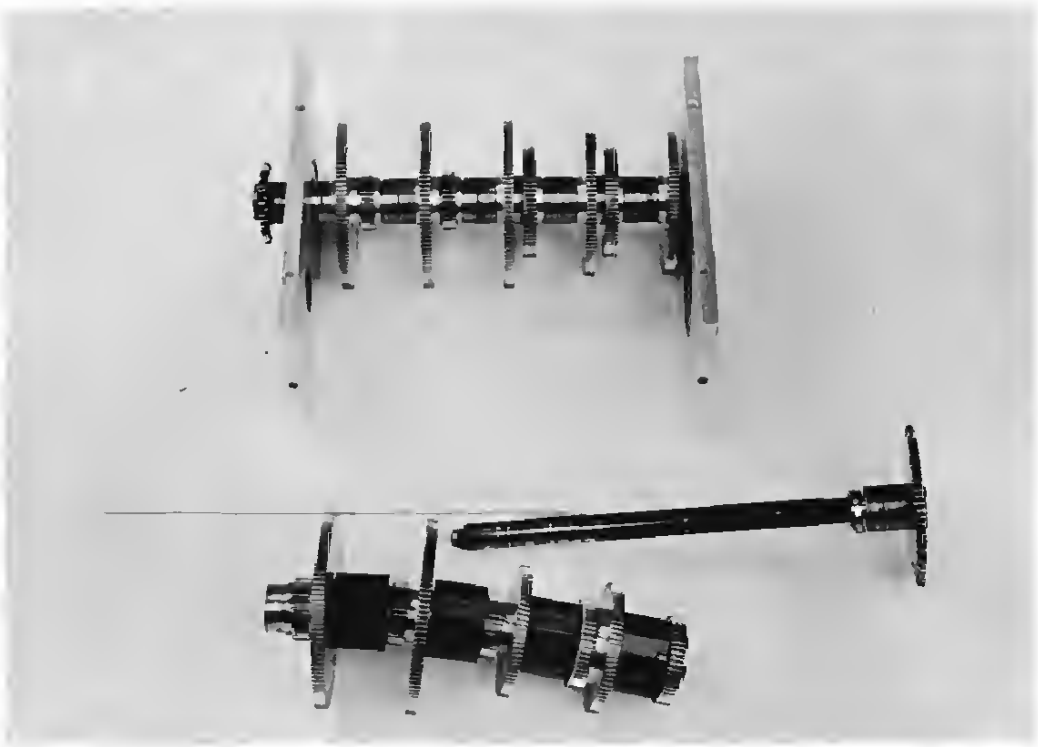


1.



2.



3.

*Figure 5-20. Gearbox Shaft Removal*



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h. Arrange each part in order on a wooden dowel for proper position during reassembly on the shaft during lubrication.

5-52. GEARBOX LUBRICATION. After all gears are arranged on the dowel, lubricate as follows:

a. Oil each gear bearing with Mystery Oil (Table 5-2) to soften gum residues.

b. Grease each primary clutch and gear assembly as shown in Figure 5-21, using the following steps to grease each assembly:

(1) Work grease into coils of each spring, and install on one half of clutch hub. Note that spring key must be in proper position (Figure 5-21).

(2) Slip plastic clutch sleeve (with ratchet teeth) over spring; mate sleeve cutout to spring key, and pack more grease into end of sleeve.

(3) Coat mating gear hub with grease and twist hub into assembled clutch and spring. As a test of clutch wear, clutch hub should "grab" spring when twisted in one direction, and slip when twisted in other. If clutch slips in both directions, replace hub and attached gear, or worn spring.

c. When all gears are reassembled onto shaft, slip shaft out as shown in Figure 5-20, leaving gear train as one unit. Oil shaft lightly with No. 10 oil (Table 5-2), and remove excess oil. Reassemble primary shaft between side plates (Figure 5-20), in reverse disassembly procedure, and tighten screw securely. Note that shaft does not rotate. Steel washer on shaft end must be properly positioned.

d. Remove secondary shaft in same way as primary shaft (Paragraph 5-5), clean gears and spring clutches without submerging them in solvent, and arrange them in order (Figure 5-22). Oil with Mystery Oil (Step a).

e. Grease each secondary clutch and gear assembly as shown in Figure 5-22. Inspect each part for damage or wear before greasing, as noted in illustration. Drag a fingernail across hub surface to inspect for wear grooves. Use following steps to grease springs and hubs:

(1) Work grease into the coils of each clutch spring.

(2) Grease each clutch hub.

(3) Twist spring and hub together. Remove excess grease. Test clutch hub by twisting in both directions. Hub should "grab" spring when twisted one way and slip when twisted other way.

When all gears are reassembled onto shaft, slip shaft out, leaving gear train as one unit (Figure 5-20). Oil shaft lightly (do not use grease).

g. Reassemble shaft between side plates and tighten screw securely.

h. Grease gearbox gear teeth with HP 6040-0222 gear grease.

i. Replace bottom cover (eight screws, Figure 5-19).

**CAUTION**

**THIS COVER ACTS AS A SPACER TO KEEP SIDE PLATES A FIXED DISTANCE APART AND PARALLEL, AND THUS SHOULD BE INSTALLED BEFORE ADJUSTING SHAFT END PLAY.**

5-53. GEARBOX SHAFT END PLAY ADJUSTMENT. The end play of the primary shaft and the secondary shaft may be adjusted with the gearbox top cover and drive motor removed. Perform the following steps for each shaft:

**CAUTION**

**END PLAY MUST BE NO MORE THAN 0.007 INCH (0,2 mm), OTHERWISE CLUTCH SPRINGS WILL WIND DOWN BETWEEN CLUTCH HUBS AND DISABLE GEARBOX.**

a. Tighten sprocket hex nut snug; back off using feeler gage to obtain 0.007 inch end play. Push all gears to one side and measure at side plate (Figure 5-18).

b. While holding hex nut so it cannot move, use a 4-40 Bristol spline wrench to tighten locking setscrew in center of hex nut (Figure 5-23). An Allen wrench will not fit.

5-54. GEARBOX REASSEMBLY. Reassemble the gearbox and adjust the tension of the input chain (transfers torque from the drive motor to the gearbox) as follows:

a. Place input chain on motor sprocket, and install gearbox top cover and motor with four screws (Figures 5-18, 5-19), leaving them loose in oval mounting holes.

b. Suspend gearbox by drive motor as in Figure 5-24. Weight of gearbox sets chain tension. Tighten screws with gearbox hanging by motor, being sure motor and gearbox are aligned.

c. To test chain alignment, sight along chain and inspect for misalignment of motor sprocket with gearbox sprocket. If necessary to straighten chain, readjust motor shaft sprocket toward or away from motor.



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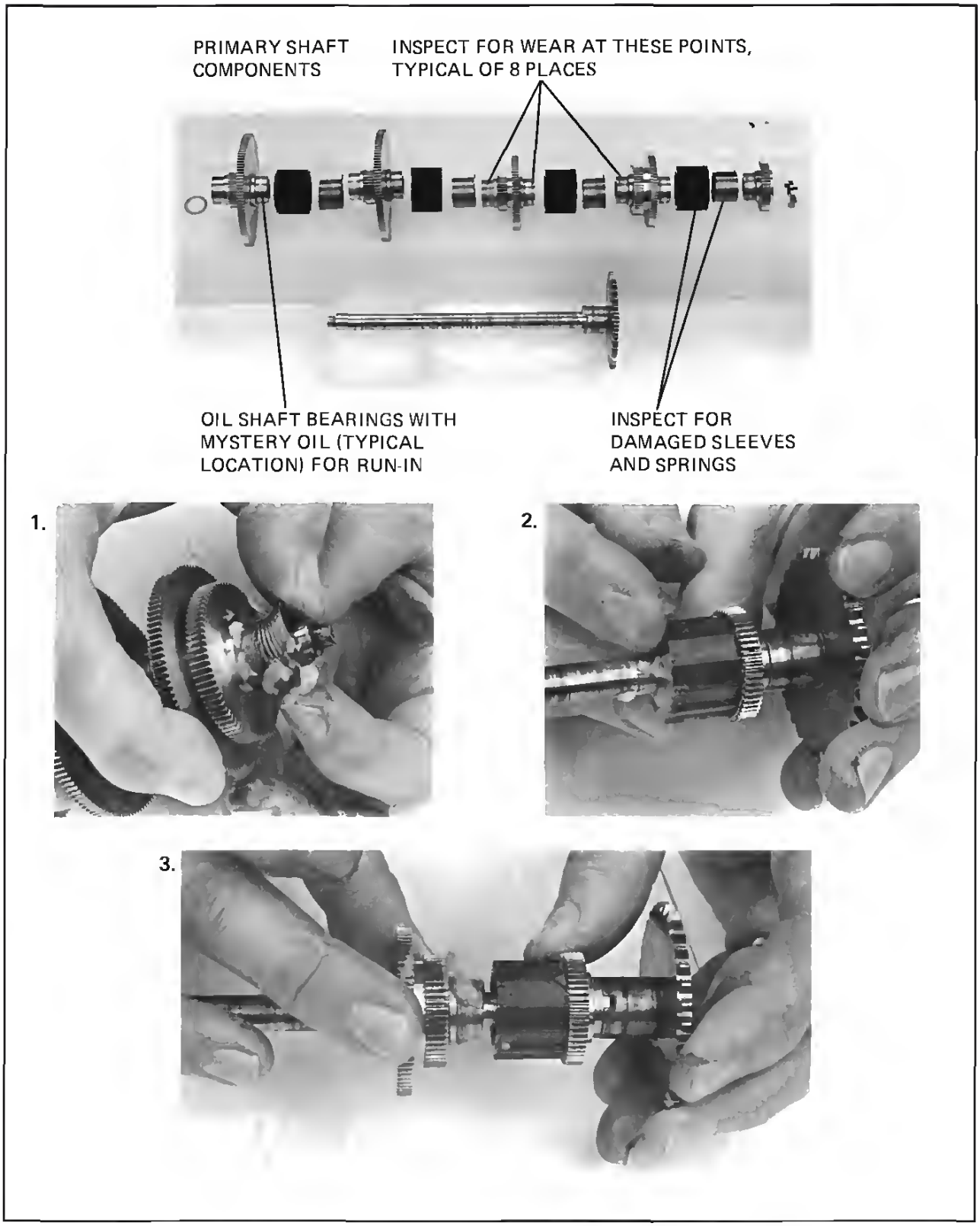
PRIMARY SHAFT COMPONENTS
INSPECT FOR WEAR AT THESE POINTS, TYPICAL OF 8 PLACES
OIL SHAFT BEARINGS WITH MYSTERY OIL (TYPICAL LOCATION) FOR RUN-IN
INSPECT FOR DAMAGED SLEEVES AND SPRINGS
1.
2.
3.

*Figure 5-21. Spring Clutch Lubrication (Primary Shaft)*



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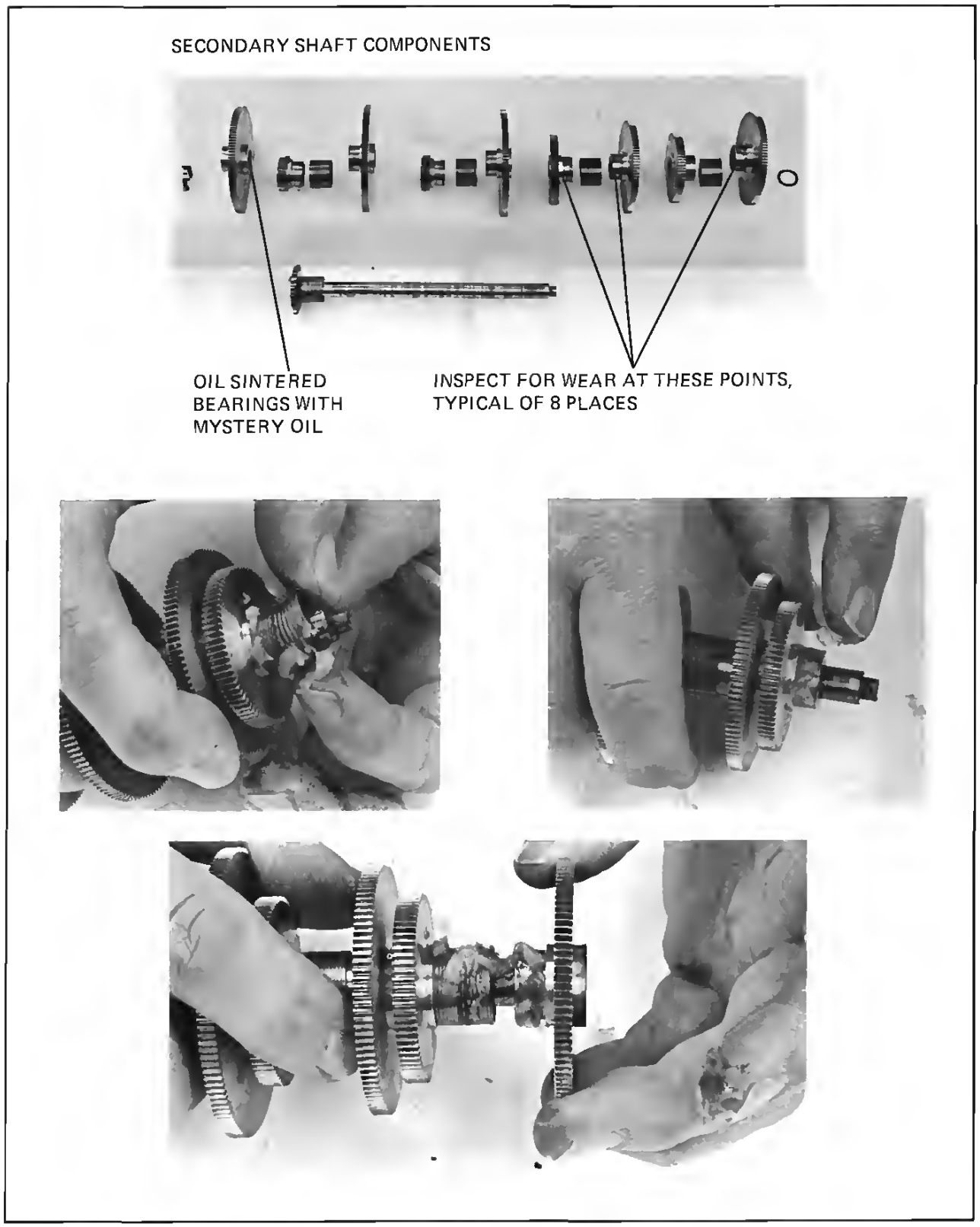
SECONDARY SHAFT COMPONENTS
OIL SINTERED BEARINGS WITH MYSTERY OIL
INSPECT FOR WEAR AT THESE POINTS, TYPICAL OF 8 PLACES

*Figure 5-22. Overriding Clutch Lubrication (Secondary Shaft)*



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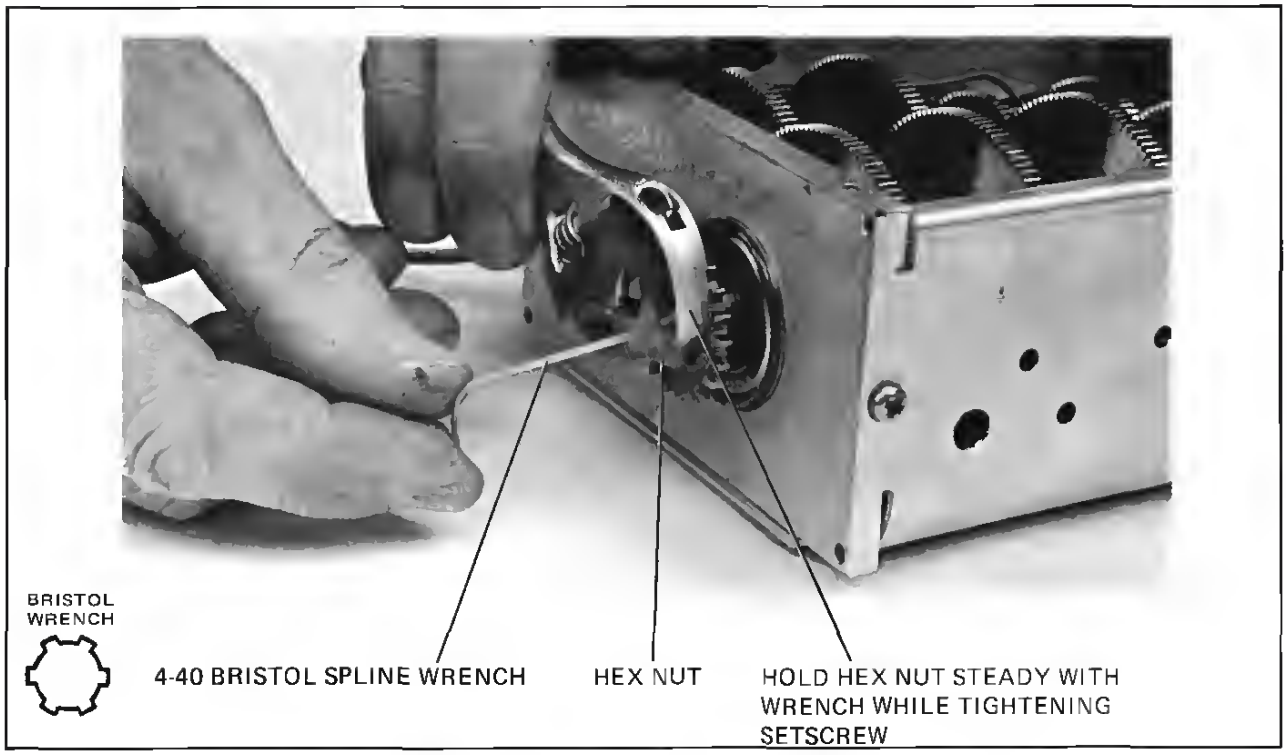


*Figure 5-23. Gearbox Shaft End Play Adjustment*

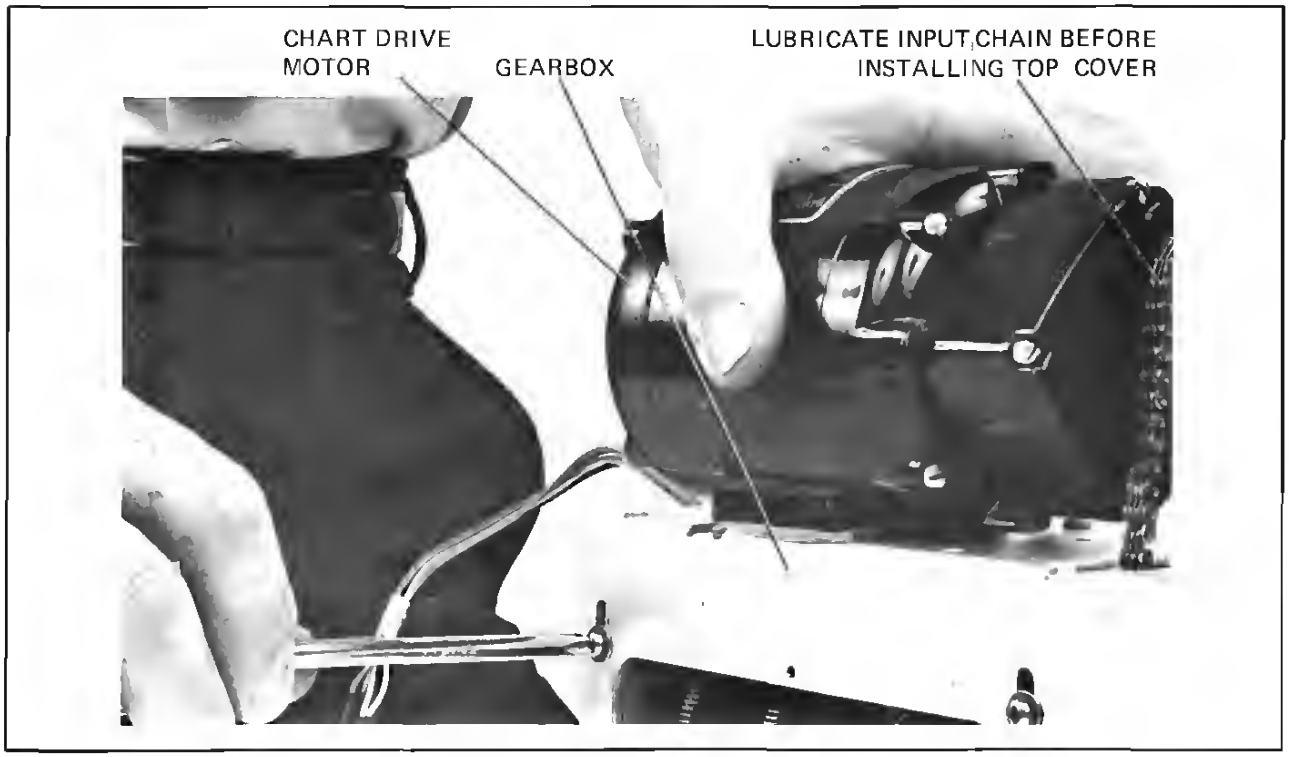


*Figure 5-24. Gearbox Input Chain Tension Adjustment*



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**5-55. Solenoid Adjustment.**

5-56. Adjust the solenoids (Figure 5-18) using the adjustment screw shown, and check *while energized* with a 0.01 feeler gage between the solenoid clapper and clutch sleeve.

5-57. GEARBOX BENCH RUN-IN. After lubricating the gearbox components, connect the gearbox to a recorder as shown in Figure 5-18. With the inspection plate removed, run the gearbox at lowest speed (selected at the recorder control panel). Excess Mystery Oil, applied in the procedure in Paragraph 5-52 will run out from between the gears, carrying with it dissolved gum and grease residue. Stop the drive motor and wipe away this residue frequently. After 15 minutes of running, run through a complete set of gear changes at the front panel of the recorder while inspecting the action of the gearbox through the inspection hole. All clutches should operate properly and the gears should rotate smoothly. Stop the drive motor and place three or four drops of No. 10 oil (Table 5-2) between the gears to lubricate the gear bearings (typical points are indicated in Figure 5-18). Run the gearbox at its lowest speed for several minutes to ensure that the oil will seep down into the gear bearings and be stored for future lubrication. Then run through the gear changes again to see that all relays are operating properly, retracting the actuators fully, and not hanging up on the clutch sleeves.

**5-58. Marker Assembly Maintenance.**

5-59. The marker assemblies are attached to adjacent galvanometers. To adjust the stylus position, first set the writing stylus bumpers (Table 5-3) and then loosen the attachment screw (Figure 5-25). Position the marker stylus so that it does not hit either bumper during its excursion, and tighten the attachment screw. Unfasten this screw to remove the stylus, and also remove the heat lead and its attachment screw. To increase stylus pressure, move stylus toward paper by loosening the screw in the slotted hole just above mounting screw for stylus. To remove the marker coil, unfasten the marker leads (Figure 5-1) from the Transfer Board Assembly, and unfasten the two marker mounting screws shown in Figure 5-25. Two stylus heat leads also must be disconnected in the marker frame area.

5-60. If the stylus only, less coil, must be replaced, remove heat leads from standoffs on galvanometer and remove Pozidriv screw from marker mounting bracket (Figure 5-25). Install the new stylus on the mounting bracket with the screw, and reinstall the heat leads. Reset stylus pressure with each new installation, and readjust the marker amplitude moveable stop, if necessary (Figure 5-25).

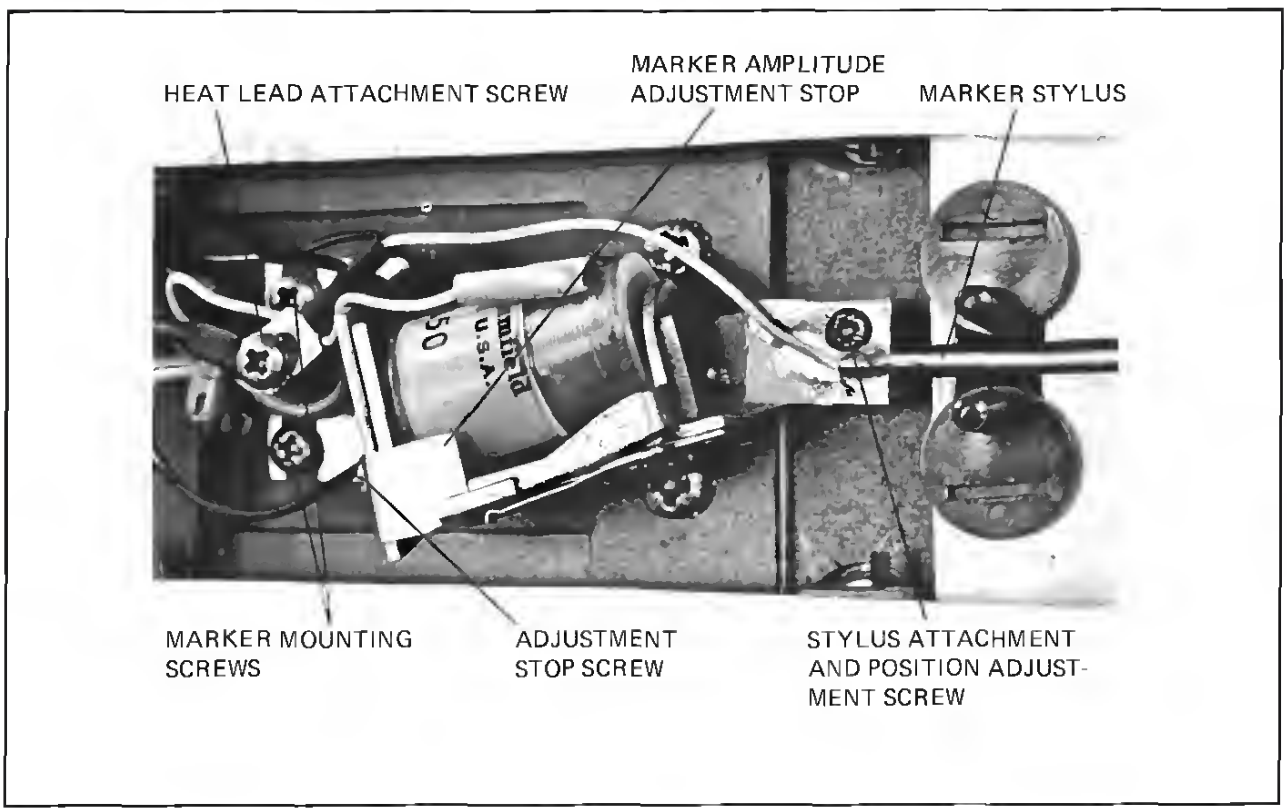


*Figure 5-25. Marker Assembly Adjustment and Removal*



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# SECTION VI
# REPLACEABLE PARTS

## 6-1. INTRODUCTION.

6-2. This section contains schematics, figures and information for identifying, locating and ordering replacement parts.

6-3. Table 6-1 lists parts in sequential order of the reference designations (circuit references) and provides the following information for each item.

a. Description of the part (see list of abbreviations on the following page).

b. Typical manufacturer of the part using a five-digit code. See the code list of manufacturers in Table 6-2.

c. Manufacturer's part number.

d. Total quantity used in the instrument (TQ column).

*Note:* Identification of the attaching parts (screws, nuts, washers, rivets, etc.) used to secure a component in place is entered immediately after the listing of the respective component in Table 6-1.

## 6-4. REFERENCE DESIGNATIONS.

6-5. Table 6-1 uses an alphabetical-numerical (alpha-numeric) method of listing the end item, assemblies, subassemblies and circuit components. These items are defined as follows.

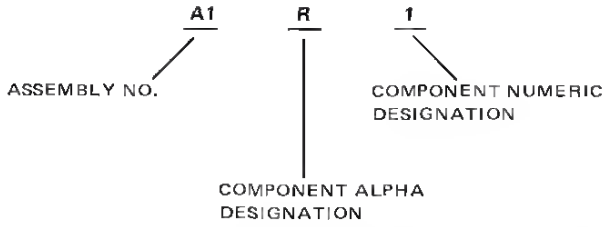
a. An END ITEM is the instrument with all the supplied accessories. The END ITEM is made up of assemblies to aid in the location of parts.

b. Each assembly and subassembly is assigned an "A" number (A1, A2, A3, etc). Assemblies and subassemblies that can be purchased have part numbers in the part number column of Table 6-1, those that cannot be purchased have the word "Reference" in the column.

c. Components within the assembly and subassembly circuits are assigned circuit reference designators (C1 capacitor, R1 resistor, etc.). These parts are prefaced by the assembly number (A1C1, A2C2, A1R1, A2R2, etc.) to indicate the assembly on which the part is located.

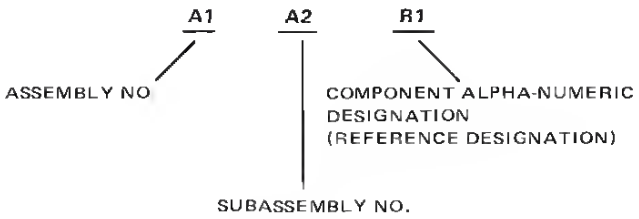
6-6. Examples of the alpha-numeric numbering method used to identify assemblies, subassemblies and circuit components follow:

a.




The complete reference designation is read as the first resistor (R1) of the first assembly (A1).

b.




The complete reference designation is read as the first resistor (R1) of the second subassembly (A2) of the first assembly (A1).

6-7. Partial reference designations are normally used on the equipment and illustrations. The partial reference designation consists of the component alpha designation and numeric designation. The complete reference designations are obtained by placing the proper assembly number (and subassembly number, when applicable) before the partial reference designations.

6-8. In this section, these assembly prefix numbers are usually shown with each reference designation, in the title of the figure or at the bottom of the illustration block following the notation "REF DESIG PREFIX". The complete reference designation should be used to easily locate a part and the description in the Parts List (Table 6-1).

6-9. For example, to determine the value and the part number of resistor R6 in the A2 assembly (A2R6), locate the A2 group listing (the second group) in the parts list. Then refer to the R (resistor) designations in the group and find R6. The value and the part number are in the columns adjacent to the description.



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## 6-10. ORDERING INFORMATION.

6-11. To order a replacement part, address order or inquiry to the local Hewlett-Packard Sales/Service Office (see list of addresses at the rear of this manual) and supply the HP part number of the item from Table 6-1.

6-12. To order a part not listed in the table, provide the following information:

a. Model number of the instrument.

b. Complete serial number of the instrument.

c. Description of the part including function and location.

6-13. To order a part from a manufacturer other than Hewlett-Packard Company provide the complete part description and the manufacturer's part number from Table 6-1.

### REFERENCE DESIGNATORS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | = assembly | F | = fuse | Q | = transistor | U | = non repairable assembly |
| B | = motor | FL | = filter | R | = resistor | V | = vacuum tube photocell, etc |
| BT | = battery | HR | = heater | RT | = thermistor | W | = cable |
| C | = capacitor | J | = jack | S | = switch | X | = socket |
| CP | = coupler | K | = relay | T | = transformer | XDS | = lampholder |
| CR | = diode | L | = inductor | TB | = terminal board | XF | = fuseholder |
| DL | = delay line | M | = meter | TC | = thermocouple | Y | = crystal |
| DS | = device signaling (lamp) | MP | = mechanical part | TP | = test point | Z | = network |
| E | = miscellaneous electronic part | P | = plug | | | | |

### ABBREVIATIONS *

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | = amperes | fil hd | = fillister head | n | = nano ($10^{-9}$) | rot | = rotary |
| ACC | = accessories | film | = film | NC | = normally closed | | |
| AFC | = automatic frequency control | FR | = front | Ne | = neon | s-b | = slow-blow |
| Al | = aluminum | fwd | = forward | NETWRK | = network | scon | = semiconductor |
| AMP | = amplifier | fxd | = fixed | Ni Pl | = nickel plate | Se | = selenium |
| as ord | = as ordered | | | NO | = normally open | sect | = section(s) |
| | | G c/s | = gigacycles per second (see G Hz) | NPN | = negative positive negative | SEMS | = machine screw with washer |
| Be Cu | = beryllium copper | Ge | = germanium | NPO | = negative positive zero (zero temperature coefficient) | SEQ | = sequential |
| BFO | = beat frequency oscillator | *GEN* | = *generator* | | | Si | = silicon |
| *bh* | = *binder head* | G Hz | = gigacycles per second | nsr | = not separately replaceable | sil | = silver |
| bp | = bandpass | gl | = glass | | | sl | = slide |
| brs | = brass | grd | = ground(ed) | obd | = order by description | SPDT | = single-pole double-throw |
| | | | | od | = outside diameter | | |
| c/s | = cycles/second (see Hz) | h | = henry(ies) | ov hd | = oval head | spl | = special |
| CALIB | = calibration | hex | = hexagonal | ox | = oxide | SPST | = single pole single-throw |
| ccw | = counterclockwise | Hg | = mercury | | | | |
| cd pl | = cadmium plate | *Hz* | = *cycle per second* | *pc* | = *printed circuit board* | *sst* | = *stainless steel* |
| cer | = ceramic | | | PEMS | = circular press fitted nut | SWTCH | = switch |
| ch | = channel | impg | = impregnated | pF | = picofarad ($10^{-12}$ farads) | | |
| cmo | = cabinet mount only | ined | = incandescent | PH | = phone | Ta | = tantalum |
| coef | = coefficient | ins | = insulation(ed) | ph brz | = phosphor bronze | td | = time delay |
| com | = common | ips | = inches per second | Phl hd | = Phillips head | Ti | = titanium |
| comp | = composition | | | piv | = peak inverse voltage | tog | = toggle |
| conn | = connector | k, K | = kilo (1000) | pk | = peak | tol | = tolerance |
| CRT | = cathode-ray tube | Kc, k c/s | = kilocycles (see k Hz) | PNL | = panel | trim | = trimmer |
| cw | = clockwise | KEPS | = hex nut with lockwasher | PNP | = positive negative positive | twt | = traveling wave tube |
| | | k Hz | = kilocycles/second | poly | = polystyrene | | |
| dB | = decibel | | | por | = porcelain | $\mu$or U | = micro ($10^{-6}$) |
| dep C | = deposited carbon | lin | = linear taper | pos | = position(s) | $\mu$A | = micromamperes |
| DISP | = display | lkwash | = lockwasher | pot | = potentiometer | $\mu$F | = microfarads |
| DPDT | = double-pole double-throw | log | = logarithmic taper | pp | = peak-to-peak | $\mu$V | = microvolts |
| DPST | = double-pole single-throw | lp flt | = low-pass filter | PREAMP | = preamplifier | | |
| | | | | prec | = precision (temperature coefficient, long term stability, and/or tolerance) | V | = volt(s) |
| EIA | = tubes or transistors meeting Electronic Industries Association standards will normally result in instrument operating within specifications tubes and transistors selected for best performance will be supplied if ordered by stock numbers | m | = milli ($10^{-3}$) | | | vac | = vacuum |
| | | mA | = milliamperes | | | Vacw | = volt(s) alternating current working |
| | | mam | = milliammeter | | | var | = variable |
| | | M | = mega,($10^{6}$) | pt | = point | Vdcw | = volt(s) direct current working |
| | | M c/s | = megacycles (see M Hz) | rec | = recorder | | |
| | | met flm | = metal film | rect | = rectifier | W | = watt(s) |
| | | mfr | = manufacturer | rev | = reverse | w/ | = with |
| elect | = electrolytic | mH | = millihenry | rf | = radio frequency | w/o | = without |
| encap | = encapsulated | M Hz | = megacycles/second | rh | = round head | wiv | = reverse working voltage |
| | | minat | = miniature | rmo | = rack mount only | | |
| F | = farad(s) | mom | = momentary | rms | = root-mean-square | ww | = wirewound |
| fet | = field effect transistor | mtg | = mounting | | | Ω | = ohm |
| fh | = flat head | mV | = millivolt | | | | |
| FIG | = *figure* | mW | = milliwatt | | | | |
| | | *my* | = *mylar*® (Dupont de Nemours) | | | | |

* Electric Accounting Machines (EAM) capitalize all abbreviations



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*Table 6-1. Replaceable Parts*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A1 | 07754-60270 | 1 | UNIT HOUSING(FIG. 6-2) | 28480 | 07754-60270 |
| A2 | 07754-60240 | 1 | CONTROL PANEL(FIG. 6-3) | 28480 | 07754-60240 |
| A2A1 | 07754-60120 | 1 | CONTROL SWITCH BOARD(FIG. 6-5) | 28480 | 07754-60120 |
| A2A2 | 07754-60130 | 1 | HEAT POTENTIOMETER BOARD(FIG. 6-6) | 28480 | 07754-60130 |
| A2A3 | 07754-60140 | 1 | PREAMPLIFIER POWER SUPPLY(FIG. 6-7) | 28480 | 07754-60140 |
| A3 | 07754-60050 | 1 | POWER SUPPLY(FIG. 6-9) | 28480 | 07754-60050 |
| A3A1 | 07754-60150 | 1 | TRANSFER BOARD(FIG. 6-11) | 28480 | 07754-60150 |
| A4 | 07754-60170 | 7 | DRIVER AMPLIFIER(FIG. 6-13) | 28480 | 07754-60170 |
| A5 | 07754-60170 | | DRIVER AMPLIFIER(FIG. 6-13) | 28480 | 07754-60170 |
| A6 | 07754-60170 | | DRIVER AMPLIFIER(FIG. 6-13) | 28480 | 07754-60170 |
| A7 | 07754-60170 | | DRIVER AMPLIFIER(FIG. 6-13) | 28480 | 07754-60170 |
| A8 | 07754-60180 | 1 | REGULATOR/OSCILLATOR BOARD:60 HZ (FIG. 6-15) | 28480 | 07754-60180 |
| A9 | 07754-60181 | 1 | REGULATOR/OSCILLATOR BOARD:50 HZ (OPT 008) | 28480 | 07754-60181 |
| A10 | 07754-60250 | 1 | DRIVE UNIT(FIG. 6-16) | 28480 | 07754-60250 |
| A10A1 | 07754-60040 | 1 | GEARBOX(FIG. 6-17) | 28480 | 07754-60040 |
| A11 | 07754-60070 | 4 | GALVANOMETER(FIG. 6-18) | 28480 | 07754-60070 |
| A11A1 | 07754-60340 | 1 | STYLUS(FIG. 6-18) | 28480 | 07754-60340 |
| A12 | 07754-60070 | | GALVANOMETER(FIG. 6-18) | 28480 | 07754-60070 |
| A13 | 07754-60070 | | GALVANOMETER(FIG. 6-18) | 28480 | 07754-60070 |
| A14 | 07754-60070 | | GALVANOMETER(FIG. 6-18) | 28480 | 07754-60070 |
| A15 | 07754-60350 | 2 | MARKER (FIG. 6-19), EVENT | 28480 | 07754-60350 |
| A16 | 07754-60350 | | MARKER (FIG. 6-19), TIMED | 28480 | 07754-60350 |
| A17 | 868-500AC13 | 1 | OSCILLATOR:2400 HZ(OPT 004, FIG. 6-20) | 28480 | 868-500AC13 |
| A18 | 868-500AC14 | 1 | OSCILLATOR:440 HZ(OPT 005, FIG. 6-21) | 28480 | 868-500AC14 |
| A19 | 07754-63499 | | ACCESSORIES(FIG. 6-22) | 28480 | 07754-63499 |
| A23 | 07754-60350 | | MARKER (FIG. 6-19), OPTION 015 | 28480 | 07754-60350 |

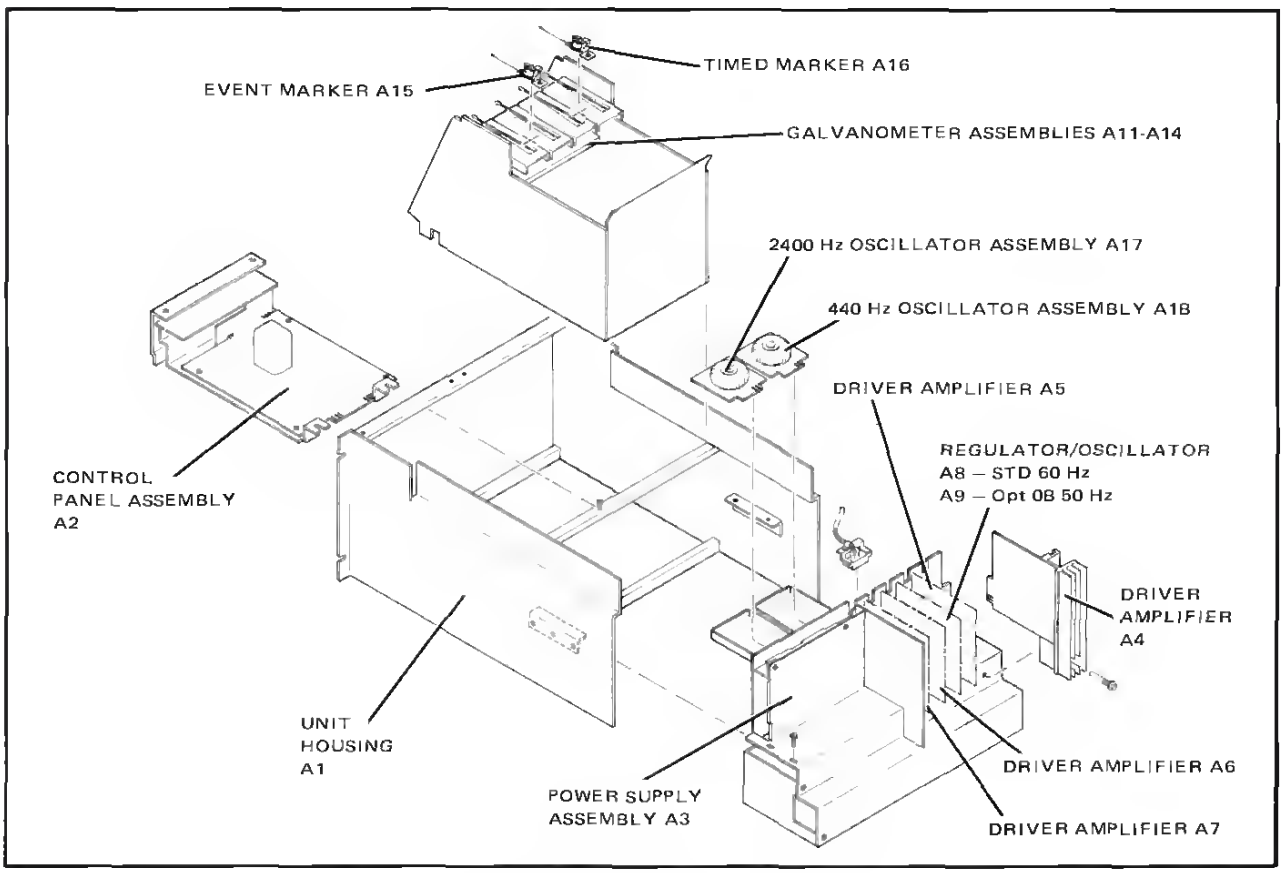


*Figure 6-1. Model 7754A Recorder (End Item)*



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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A1 | 07754-60270 | | UNIT HOUSING(FIG. 6-2) | 28480 | 07754-60270 |
| A1E1 | 07754-00411 | 1 | TRIM STRIP | 28480 | 07754-00411 |
| | 2360-0182 | 10 | SCREW:FLAT HD POZI DR 6-32 X 0.312" LG | 00000 | OBD |
| A1MP1 | 07754-00063 | 1 | PANEL:SIDE, LEFT | 28480 | 07754-00063 |
| A1MP2 | 07754-00064 | 1 | PANEL:SIDE, RIGHT | 28480 | 07754-00064 |
| A1MP3 | 07754-00070 | 2 | MOUNT:POWER SUPPLY | 28480 | 07754-00070 |
| | 2510-0123 | 17 | SCREW:FLAT HD POZI DR 8-32 X 0.500" LG | 00000 | OBD |
| | 2580-0006 | 15 | NUT:HEX 8-32 THREAD | 78189 | KEP511-081800-00 |
| A1MP4 | 07754-00080 | 1 | GUIDE:AMPLIFIER | 28480 | 07754-00080 |
| | 2200-0165 | 8 | SCREW:FLAT HD POZI DR 4-40 X 1/4" | 00000 | OBD |
| A1MP5 | 07754-20311 | 1 | BAR:CROSS, FRONT | 28480 | 07754-20311 |
| | 2510-0123 | | SCREW:FLAT HD POZI DR 8-32 X 0.500" LG | 00000 | OBD |
| A1MP6 | 07754-20320 | 1 | BAR:CROSS, TOP | 28480 | 07754-20320 |
| | 2510-0123 | | SCREW:FLAT HD POZI DR 8-32 X 0.500" LG | 00000 | OBD |
| A1MP7 | 07754-20330 | 1 | BAR:CROSS, REAR | 28480 | 07754-20330 |
| | 2510-0123 | | SCREW:FLAT HD POZI DR 8-32 X 0.500" LG | 00000 | OBD |
| A1MP8 | 07754-20350 | 1 | BAR:CROSS, CONTROL PANEL | 28480 | 07754-20350 |
| | 2360-0182 | | SCREW:FLAT HD POZI DR 6-32 X 0.312" LG | 00000 | OBD |
| A1MP9 | 07754-00770 | 1 | BRACKET:CONTROL SWITCH COVER | 28480 | 07754-00770 |
| A2 | 07754-60240 | | CONTROL PANEL(FIG. 6-3) | 28480 | 07754-60240 |
| | 2360-0185 | 5 | SCREW:FLAT HD POZI DR 6-32 X 0.500" LG | 00000 | OBD |
| | 2680-0051 | 5 | SCREW:PAN HD POZI DR 10-32 X 0.375" LG | 00000 | OBD |
| A2MP1 | 0370-1005 | 4 | KNOB:JADE GREY | 28480 | 0370-1005 |
| A2MP2 | 0370-1005 | | KNOB:JADE GREY | 28480 | 0370-1005 |
| A2MP3 | 0370-1005 | | KNOB:JADE GREY | 28480 | 0370-1005 |
| A2MP4 | 0370-1005 | | KNOB:JADE GREY | 28480 | 0370-1005 |
| A2MP5 | 07754-00090 | 1 | BASE:PREAMP BOARD | 28480 | 07754-00090 |
| | 2200-0103 | 6 | SCREW:SST PHH POZI DR 4-40 X 1/4"W/LK | 00000 | OBD |
| A2MP6 | 07754-00101 | 1 | PANEL:CONTROL | 28480 | 07754-00100 |
| | 0380-0801 | 2 | SPACER:0.250" OD, 4-40 TAP | 00000 | OBD |
| | 2200-0165 | | SCREW:FLAT HD POZI DR 4-40 X 1/4" | 00000 | OBD |
| A2MP7 | 0370-2051 | 16 | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP8 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP9 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP10 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP11 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP12 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP13 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP14 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP15 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP16 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP17 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP18 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP19 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP20 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP21 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2MP22 | 0370-2051 | | KNOB:PUSHBUTTON, JADE GRAY | 28480 | 0370-2051 |
| A2A1 | 07754-60120 | | CONTROL SWITCH BOARD(FIG. 6-5) | 28480 | 07754-60120 |
| | 2200-0103 | | SCREW:SST PHH POZI DR 4-40 X 1/4"W/LK | 00000 | OBD |
| A2A1C1 | 0150-0052 | 18 | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A2A1C2 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A2A1C3 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A2A1C4 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A2A1C5 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A2A1C6 | 0160-3097 | 1 | C: FXD CER 0.47 UF +80% -20% | 56289 | 5C54C2-CML |
| A2A1CR1 | 1901-0033 | 22 | DIODE:SILICON 100MA 180WV | 07263 | FD3369 |
| A2A1CR2 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | FD3369 |
| A2A1CR3 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | FD3369 |
| A2A1CR4 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | FD3369 |
| A2A1J26 | 1251-2034 | 1 | CONNECTOR:PC EDGE (2 X 10) 20 CONTACT | 71785 | 252-10-30-300 |
| | 2340-0001 | 22 | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | OBD |
| | 2200-0111 | 4 | SCREW:PAN HD POZI DR 4-40 X 0.500" LG | 00000 | OBD |
| A2A1MP1 | 516-5 | 2 | BRACKET:RIGHT ANGLE | 28480 | 516-5 |
| | 0361-0350 | 4 | RIVET:SEMITUBULAR OVAL HEAD | 00000 | OBD |
| A2A1R1 | 0683-2705 | 6 | R:FXD COMP 27 OHM 5% 1/4W | 01121 | CB 2705 |
| A2A1R3 | 0683-4715 | 5 | R:FXD COMP 470 OHM 5% 1/4W | 01121 | CB 4715 |
| A2A1R4 | 0683-2715 | 1 | R:FXD COMP 270 OHM 5% 1/4W | 01121 | CB 2715 |
| A2A1R5 | 0683-1015 | 17 | R:FXD COMP 100 OHM 5% 1/4W | 01121 | CB 1015 |
| A2A1R6 | 0683-2705 | | R:FXD COMP 27 OHM 5% 1/4W | 01121 | CB 2705 |
| A2A1R7 | 0683-2705 | | R:FXD COMP 27 OHM 5% 1/4W | 01121 | CB 2705 |
| A2A1R8 | 0683-2705 | | R:FXD COMP 27 OHM 5% 1/4W | 01121 | CB 2705 |
| A2A1R9 | 0683-2705 | | R:FXD COMP 27 OHM 5% 1/4W | 01121 | CB 2705 |
| A2A1R10 | 0683-2705 | | R:FXD COMP 27 OHM 5% 1/4W | 01121 | CB 2705 |
| A2A1R11 | 0683-1005 | 1 | R: FXD COMP 10 OHM 5% 1/4W | 01121 | CB-1005 |
| A2A1S2 | 3101-1289 | 1 | SWITCH:PUSHBUTTON | 28480 | 3101-1289 |
| A2A1U1 | 07754-00120 | 1 | BOARD:BLANK PC | 28480 | 07754-00120 |
| A2A2 | 07754-60130 | 1 | HEAT POTENTIOMETER BOARD(FIG. 6-6) | 28480 | 07754-60130 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A2A2J25 | 1251-0498 | 1 | CONNECTOR:PC EDGE 1 X 22 CONTACT | T1T85 | 252-22-30-350 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0111 | | SCREW:PAN HD P021 DR 4-40 X 0.500" LG | 00000 | 080 |
| A2A2R1 | 2100-3062 | 4 | R:VAR CONP 500 OHN 10% LIN 1/2W | 28480 | 2100-3062 |
| A2A2R2 | 2100-3062 | | R:VAR CONP 500 OHN 10% LIN 1/2W | 28480 | 2100-3062 |
| A2A2R3 | 2100-3062 | | R:VAR CONP 500 OHN 10% LIN 1/2W | 28480 | 2100-3062 |
| A2A2R4 | 2100-3062 | | R:VAR CONP 500 OHN 10% LIN 1/2W | 28480 | 2100-3062 |
| A2A2U1 | 07754-00130 | 1 | 8OARQ:8LANK PC | 28480 | 07754-00130 |
| A2A3 | 07754-60140 | | PREANPLIFIER POWER SUPPLY(F1G. 6-T) | 28480 | 0T754-60140 |
| | 2360-0113 | 6 | SCREW:PAN HO P02I 6-32 X 1/4 W/LK | 00000 | 080 |
| A2A3CRI | 2901-0033 | | DIODE:SILICON 100NA I80WV | 07263 | FD3369 |
| A2A3CR2 | 1901-0033 | | OIODE:SILICON 100MA 180WV | 07263 | F03369 |
| A2A3F1 | 2110-0234 | 1 | FUSE:0.I ANP 250V SLOW-BLDW | T5915 | 313.100/S |
| A2A3M1 | 1010-0032 | 1 | METER:INOICATOR | 18583 | NO0EL 120 LC |
| A2A3NP1 | 1205-0021 | 1 | HEAT DISSIPATOR FOR TO-3 TRANSISTOR | 28480 | 1205-0021 |
| A2A3NP2 | I205-0213 | 2 | NEAT SINK:TRANSISTOR | 13103 | 22288 |
| A2A3NP3 | 1205-0213 | | HEAT SINK:TRANSISTOR | 13103 | 22288 |
| A2A3NP4 | 01250-21720 | 1 | SPACER | 28480 | 01250-21T20 |
| A2A3Q1 | 1853-0066 | 27 | TSTR:SI PNP | 80131 | 2N4250 |
| A2A3Q2 | 1854-0071 | 27 | TSTR:SI NPN(SELECTEO FROM 2N3T04) | 28480 | 1854-0071 |
| A2A3Q3 | 1854-0063 | 15 | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | 21 | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2190-0008 | 14 | WASHER:SPLIT LOCK #6 | 00000 | 080 |
| | 2360-0119 | 10 | SCREW:SST PAN HO P02 OR 6-32 X 7/16" | 00000 | 08D |
| | 2500-0001 | 42 | NUT:HEX 6-32 THREAO | 00000 | 080 |
| A2A3Q4 | 1853-0045 | 9 | TSTR:SI PNP | 80131 | 2N4036 |
| | 1200-0181 | 14 | NOUNTING:TRANSISTOR PAO | 13103 | 7717-5-N |
| A2A3Q5 | 1853-0045 | | TSTR:S1 PNP | 80131 | 2N4036 |
| | 1200-0181 | | NOUNTING:TRANSISTOR PAO | 13103 | 7717-5-N |
| A2A3R1 | 2I00-2031 | 8 | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R2 | 2100-2031 | | R:VAR 50K ONN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R3 | 2100-2031 | | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R4 | 2100-2031 | | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R5 | 2100-2031 | | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R6 | 2100-2031 | | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R7 | 2100-2031 | | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R8 | 2100-2031 | | R:VAR 50K OHN 10% LIN 1/2W | 28480 | 2100-2031 |
| A2A3R9 | 0683-6815 | 1 | R:FXO COMP 680 OHM 5% 1/4W | 01121 | C8 6815 |
| A2A3R10 | 2100-1T72 | 1 | R:VAR WW 500 OHM 5% TYPE H 1W | 28480 | 2100-1772 |
| A2A3R11 | 0T61-00S2 | 2 | R:FXO NET OX 270 OHN 5% 1W | 28480 | 0761-0052 |
| A2A3R12 | 0686-1515 | 4 | R:FXO CONP 150 OHM 5% 1/2W | 01121 | E8 1515 |
| A2A3R13 | 0683-1215 | 1 | R:FXO COMP 120 OHN 5% 1/4W | 01121 | C8 1215 |
| A2A3R14 | 0811-1732 | 14 | R:FXO WW 1 OHN 5% 3W | 28480 | 0811-1732 |
| A2A3R15 | 0686-3325 | 1 | R:FXO CONP 3300 OHN 5% 1/2W | 01121 | E8 3325 |
| A2A3R16 | 0686-2215 | 1 | R:FXO COMP 220 OHM 5% 1/2W | 01121 | E8 2215 |
| A2A3R17 | 0761-0052 | | R:FXO NET OX 270 OHN 5% 1W | 28480 | 0761-0052 |
| A2A3R18 | 0686-1525 | 5 | R:FXO CONP 1500 OHN 5% 1/2W | 01121 | E8 1525 |
| A2A3R19 | 0686-3315 | 2 | R:FXO CONP 330 OHN 5% 1/2W | 01121 | E8 3315 |
| A2A3R20 | 0683-4705 | 2 | R:FXO CONP 47 OHN 5% 1/4W | 01121 | C8 4705 |
| A2A3R21 | 0683-4705 | | R:FXO COMP 47 OHM 5% 1/4W | 01121 | C8 4705 |
| A2A3R22 | 0686-3315 | | R:FXO CONP 330 OHN 5% 1/2W | 01121 | E8 3315 |
| A2A3R23 | 0683-5655 | 1 | R:FXO CONP 5.6 NEGOHM 5% I/4W | 01121 | C8 5655 |
| A2A3T1 | 9100-1925 | 1 | TRANSFORMER:OUTPUT | 28480 | 9100-1925 |
| | 2190-07S7 | 2 | WASHER:FLAT FOR #6 HOW | 00000 | 080 |
| | 2500-0006 | 2 | NUT:HEX 6-32 THREAO | 00000 | 080 |
| A2A3U1 | 07754-00140 | 1 | 8OARO:8LANK PC | 28480 | 07T54-00140 |
| A2A3XF1 | 2110-0269 | 2 | CL1P:FUSE 0.250" OIA | 91506 | 6008-32CN |
| A3 | 07754-60050 | 1 | POWER SUPPLY(FIG. 6-9) | 28480 | 07754-60050 |
| | 1251-1679 | 6 | CONNECTOR BLOCK:14 CONTACT | 28480 | 1251-1679 |
| | 1400-0017 | 7 | CLANP,CABLE NYLON 5/16 | 71616 | CPC-1953-5B |
| | 1251-2744 | 12 | CONTACT:R & P CONNECTOR, 16 FENALE | 00779 | 66104-1 |
| | 2190-0758 | 2 | WASHER:FLAT #8 | 00000 | 080 |
| | 2190-0760 | 4 | WASHER:FLAT #10 | 00000 | 080 |
| | 2530-0004 | 2 | SCREW:FLAT HO SLOT OR 8-32 X 0.625" LG | 00000 | 080 |
| | 2580-0006 | | NUT:HEX 8-32 THREAO | T8189 | KEPS11-081800-00 |
| | 2680-0055 | 8 | SCREW:SST PAN HO POZI OR 10-32 X 0.500" | 00000 | 080 |
| A3C1 | 0I80-2367 | 2 | C:FXO AL ELECT 16000 UF +75-10% 30VDCW | 56289 | 360163G030BD6A |
| | 2510-0051 | 2 | SCREW:PAN HO POZ1 OR 8-32 X 0.625" LG | 00000 | 080 |
| A3C2 | 0180-2367 | | C:FXO AL ELECT 16000 UF +75-10% 30VOCW | 56289 | 360163G030B06A |
| | 2510-0051 | | SCREW:PAN HD POZI OR 8-32 X 0.625" LG | 00000 | 080 |
| A3C3 | 0180-2366 | 1 | C:FXO AL ELECT 5400 UF +75-10% 30VDCW | 56289 | 32D542G030A06A |
| | 2360-0123 | 5 | SCREW:SST PAN HO POZ OR 6-32 X 5/8" | 00000 | 080 |
| | 2480-0006 | 11 | NUT:HEX 6-32 THREAD | 00000 | 080 |
| A3C4 | 0150-0052 | | C:FXO CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| | 0160-2149 | 1 | CLANP:CAPACITOR | 56289 | 4586-97A |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A3CR1 | 1901-0164 | 6 | DIODE:SILICON 200PIV 3A | 04713 | 1N4721 |
| A3CR2 | 1901-0164 | | DIODE:SILICON 200PIV 3A | 04713 | 1N4721 |
| A3CR3 | 1901-0164 | | DIODE:SILICON 200PIV 3A | 04713 | 1N4721 |
| A3CR4 | 1901-0164 | | DIODE:SILICON 200PIV 3A | 04713 | 1N4721 |
| A3CR5 | 1901-0164 | | DIODE:SILICON 200PIV 3A | 04713 | 1N4721 |
| A3CR6 | 1901-0164 | | DIODE:SILICON 200PIV 3A | 04713 | 1N4721 |
| A3E1 | 0360-1092 | 2 | TERMINAL STRIP:8 TERMINALS | 71785 | 326-20-08-001 |
| A3E2 | 0360-1092 | | TERMINAL STRIP:8 TERMINALS | 71785 | 326-20-08-001 |
| A3F1 | 2110-0386 | 2 | FUSE:6 AMP AT 250V | 71400 | ABC-6-A |
| A3F2 | 2110-0380 | 2 | FUSE:2.5 AMP AT 250 V SLOW-BLOW | 71400 | MDA-2-1/2 |
| A3F3 | 2110-0381 | 4 | FUSE:3.0 AMP AT 250V SLOW-BLOW | 71400 | MDA 3 |
| A3F4 | 2110-0361 | | FUSE:3.0 AMP AT 250V SLOW-BLOW | 71400 | MDA 3 |
| A3F5 | 2110-0381 | | FUSE:3.0 AMP AT 250V SLOW-BLOW | 71400 | MDA 3 |
| A3J1 | 1251-1842 | 4 | CONNECTOR:16 FEMALE CONTACT | 28480 | 1251-1842 |
| | 2200-0166 | 22 | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | 18 | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 0360-1357 | 4 | TERMINAL:SOLDER LUG FOR #5 SCREW | 00000 | OBD |
| A3J2 | 1251-1842 | | CONNECTOR:16 FEMALE CONTACT | 28480 | 1251-1842 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 0360-1357 | | TERMINAL:SOLDER LUG FOR #5 SCREW | 00000 | OBD |
| A3J3 | 1251-1842 | | CONNECTOR:16 FEMALE CONTACT | 28480 | 1251-1842 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 0360-1357 | | TERMINAL:SOLDER LUG FOR #5 SCREW | 00000 | OBD |
| A3J4 | 1251-1842 | | CONNECTOR:16 FEMALE CONTACT | 28480 | 1251-1842 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 0360-1357 | | TERMINAL:SOLDER LUG FOR #5 SCREW | 00000 | OBD |
| A3J5 | 9100-3142 | 1 | FILTER:LINE 6A 50-400 HZ | 28480 | 9100-3142 |
| | 2200-0107 | 6 | SCREW:POZI DR 4-40 X 3/8 W/LOCK | 00000 | OBD |
| A3J6 | 1251-2358 | 1 | CONNECTOR:AC POWER, 3 FEMALE CONTACT | 28480 | 1251-2358 |
| | 0361-0346 | 6 | RIVET:SEMITUBULAR OVAL HEAD | 00000 | OBD |
| A3J7 | 1251-1682 | 2 | BODY:R & P CONNECTOR 14 POSITION | 00779 | 201298-1 |
| A3J9 | 8120-0961 | 1 | CABLE:CONNECTOR 2 FEMALE PIN | 28480 | 8120-0961 |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 2200-0107 | | SCREW:POZI DR 4-40 X 3/8 W/LOCK | 00000 | OBD |
| A3J11 | 1251-1894 | 4 | CONNECTOR:5 MALE CONTACT | 28480 | 1251-1894 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 1251-1827 | 4 | EXTENSION:GUARD | 28480 | 1251-1827 |
| | 1251-1828 | 4 | GUARD FOR SPECIAL PURPOSE CONNECTOR | 05245 | SM205 |
| A3J12 | 1251-1894 | | CONNECTOR:5 MALE CONTACT | 28480 | 1251-1894 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 1251-1827 | | EXTENSION:GUARD | 28480 | 1251-1827 |
| | 1251-1828 | | GUARD FOR SPECIAL PURPOSE CONNECTOR | 05245 | SM205 |
| A3J13 | 1251-1894 | | CONNECTOR:5 MALE CONTACT | 28480 | 1251-1894 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 1251-1827 | | EXTENSION:GUARD | 28480 | 1251-1827 |
| | 1251-1828 | | GUARD FOR SPECIAL PURPOSE CONNECTOR | 05245 | SM205 |
| A3J14 | 1251-1894 | | CONNECTOR:5 MALE CONTACT | 28480 | 1251-1894 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| | 0590-0199 | | NUT:EXT LOCK #4-40 | 00000 | OBD |
| | 1251-1827 | | EXTENSION:GUARD | 28480 | 1251-1827 |
| | 1251-1828 | | GUARD FOR SPECIAL PURPOSE CONNECTOR | 05245 | SM205 |
| A3J21 | 1251-1945 | 4 | CONNECTOR:10 FEMALE CONTACT | 28480 | 1251-1945 |
| A3J22 | 1251-1945 | | CONNECTOR:10 FEMALE CONTACT | 28480 | 1251-1945 |
| A3J23 | 1251-1945 | | CONNECTOR:10 FEMALE CONTACT | 28480 | 1251-1945 |
| A3J24 | 1251-1945 | | CONNECTOR:10 FEMALE CONTACT | 28480 | 1251-1945 |
| A3J31 | 1251-1682 | | BODY:R & P CONNECTOR 14 POSITION | 00779 | 201298-1 |
| A3J32 | 1251-1295 | 1 | BODY:R & P CONNECTOR, 14 POSITION | 00779 | 201335-1 |
| A3K1 | 0490-0424 | 1 | RELAY:DPDT 2A AT 125 VAC | 78277 | 42RD6-2500S-SIL |
| A3MP1 | 07754-0005D | 1 | CHASSIS:POWER SUPPLY | 28480 | 07754-00050 |
| A3MP2 | 7120-0004 | 1 | NAMEPLATE:SERIAL | 28480 | 7120-0004 |
| A3MP3 | 07754-60440 | 1 | CHASSIS AND TERMINAL STRIP | 28480 | 07754-60440 |
| | 2680-0051 | | SCREW:PAN HD POZI DR 10-32 X 0.375" LG | 00000 | OBD |
| | 2680-0118 | 1 | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | OBD |
| A3MP4 | 2420-0006 | 9 | NUT:HEX 6-32 THREAD | 00000 | OBD |
| | 2360-0197 | 2 | SCREW:SST PAN HD 6-32 X .375 | 00000 | OBD |
| A3MP5 | 0180-0078 | 2 | CLAMP: CAPACITOR MOUNTING | 56289 | 4586-28 |
| | 2510-0045 | 10 | SCREW:PAN HD POZI DR 8-32 X 0.375" LG | 00000 | OBD |
| | 2580-0006 | | NUT:HEX 8-32 THREAD | 78189 | REP511-081800-00 |
| A3MP6 | 01250-21401 | 2 | SPACER:POWER SUPPLY | 28480 | 01250-21401 |

(ATTACHING PARTS, NEXT PAGE)

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| | 2200-0105 | 19 | SCREW:PAN HD POZI DR 4-40 X 0.312" LG | 00000 | 080 |
| | 2360-0116 | 2 | SCREW:SST FLAT HD POZI DR 6-32 | 00000 | 080 |
| | 2480-0006 | | NUT:HEX 6-32 THREAD | 00000 | 080 |
| | 07754-00340 | 1 | COVER:TRANSFORMER | 28480 | 07754-00340 |
| | 2200-0105 | | SCREW:PAN HD POZI DR 4-40 X 0.312" LG | 00000 | 080 |
| A3MP8 | 07T54-00530 | 1 | COVER:BOTTOM | 28480 | 07T54-00530 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | 080 |
| A3MP9 | 07754-00540 | 1 | SHIELD:DRIVER | 28480 | 07T54-00540 |
| | 2200-0105 | | SCREW:PAN HD POZI DR 4-40 X 0.312" LG | 00000 | 080 |
| A3MP10 | 07826-40040 | 1 | SHIELD:PC BOARD | 28480 | 07826-40040 |
| | 2200-0105 | | SCREW:PAN HD POZI DR 4-40 X 0.312" LG | 00000 | 080 |
| | 2200-0191 | 1 | SCREW:PAN HD SLOT DR 4-40 X 1.000" LG | 00000 | 080 |
| A3MP11 | 07754-00870 | 1 | DECAL:POWER SUPPLY, CAUTION(NOT SHOWN) | 28480 | 0TT54-00870 |
| A3MP12 | 07826-40050 | 2 | FOOT:RUBBER | 28480 | 07826-40050 |
| A3PT | 1251-2446 | 1 | CONNECTOR:12 PIN, MINIATURE | 28480 | 1251-2446 |
| | 1400-0018 | 3 | CLAMP:CABLE NYLON 7/16 DIA | T1616 | CPC-1953-TA |
| | 2360-0185 | | SCREW:FLAT HD POZI DR 6-32 X 0.500" LG | 00000 | 080 |
| | 2420-0006 | | NUT:HEX 6-32 THREAD | 00000 | 080 |
| | 0360-1458 | 1 | TERMINAL:SOLDER LUG FOR #5 SCREW | 00000 | 080 |
| A3P8 | 1251-0198 | 7 | CONNECTOR:PC EDGE (2 X 6) 12 CONTACT | T1T85 | 251-06-30-261 |
| | 1251-1005 | 3 | GUIDE:R & P CONNECTOR, SERIES M | 00TT9 | 200390-4 |
| | 1251-1006 | 2 | GUIDE:R & P CONNECTOR, SERIES M | 00779 | 200389-4 |
| | 1251-1694 | 1 | CATCHES:R & P CONNECTOR | 00TT9 | 201673-1 |
| A3R1 | 0683-2735 | 6 | R:FXD COMP 27K OHM 5% 1/4W | 01121 | CB 2735 |
| A3R2 | 0683-2225 | 1 | R:FXD COMP 2.2K OHM 5% 1/4W | 01121 | CB 2225 |
| A3R3 | 0686-1515 | | R:FXD COMP 150 OHM 5% 1/2W | 01121 | EB 1515 |
| A3S1 | 3101-1395 | 1 | SWITCH:PUSHBUTTON DPDT-DB | 76854 | 53-6T280-121/A1H |
| | 2190-0735 | 1 | WASHER:FLAT METALLIC 1/2" ID | 00000 | 080 |
| A3S4 | 3101-1234 | 1 | SWITCH:SLIDE DPDT | 82389 | 11A-1242 |
| | 0361-0346 | | RIVET:SEMITUBULAR OVAL HEAD | 00000 | 080 |
| A3T1 | 9100-2361 | 1 | TRANSFORMER:POWER | 28480 | 9100-2361 |
| | 0590-0304 | 4 | NUT:HEX STL 1/4-20 THREAD SIZE | 00000 | 080 |
| A3U1 | 07754-00160 | 1 | BOARD:BLANK PC | 28480 | 0TT54-00160 |
| A3XF1 | 1400-0085 | 5 | FUSEHOLDER | T5915 | 342004 |
| A3XF2 | 1400-0085 | | FUSEHOLDER | T5915 | 342004 |
| A3XF3 | 1400-0085 | | FUSEHOLDER | T5915 | 342004 |
| A3XF4 | 1400-0085 | | FUSEHOLDER | T5915 | 342004 |
| A3XF5 | 1400-0085 | | FUSEHOLDER | 75915 | 342004 |
| A3XK1 | 1200-0727 | 1 | SOCKET:TUBE, OCTAL | 71T85 | 101-12-10-044 |
| | 0361-0346 | | RIVET:SEMITUBULAR OVAL HEAD | 00000 | 080 |
| A3W1 | 0T754-60450 | 1 | CABLE:SIGNAL JUMPER | 28480 | 0TT54-60450 |
| A3A1 | 07754-60150 | 1 | TRANSFER BOARD(FIG. 6-11) | 28480 | 0T754-60150 |
| | 1251-1249 | 1 | KEY:POLARIZING | 02660 | 143-953 |
| | 2360-011T | 9 | SCREW:PAN HD POZI 6-32 X 3/8 M/LX | 00000 | 080 |
| | 1251-2205 | 4 | KEY:POLARIZING FOR PC CONNECTORS | 71T85 | 080 |
| A3A1C1 | 0180-0097 | 1 | C:FXD TANT, 4T UF 10% 35VDCW | 56289 | 1500476X9035S2-DYS |
| A3A1CR1 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 0T263 | F03369 |
| A3A1CR2 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | F03369 |
| A3A1J10 | 1251-1886 | 1 | CONN:PC 30-CONTACT (2X15) | 71T85 | 252-15-30-340 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | 34 | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J15 | 1251-1962 | 5 | CONNECTOR:PC (2 X 10) 20 CONTACT | 71T85 | 252-10-30-330 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J16 | 1251-1962 | | CONNECTOR:PC (2 X 10) 20 CONTACT | 71T85 | 252-10-30-330 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J17 | 1251-1962 | | CONNECTOR:PC (2 X 10) 20 CONTACT | 71T85 | 252-10-30-330 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J18 | 1251-1962 | | CONNECTOR:PC (2 X 10) 20 CONTACT | 71T85 | 252-10-30-330 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J19 | 1251-1962 | | CONNECTOR:PC (2 X 10) 20 CONTACT | 71T85 | 252-10-30-330 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J20 | 1251-188T | 1 | CONNECTOR:PC 44 CONTACTS(2 X 22) | 71T85 | 252-22-30-340 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J27 | 1251-1968 | 2 | CONNECTOR:PC 10 TUNING FORK TYPE CONT | 02660 | 143-010-07-1158 |
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J28 | 1251-1968 | | CONNECTOR:PC 10 TUNING FORK TYPE CONT | 02660 | 143-010-0T-1158 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| | 2340-0001 | | NUT:HEX 4-40 X 0.188" ACROSS FLAT | 00000 | 080 |
| | 2200-0113 | | SCREW:PAN HD POZI DR 4-40 X 0.625" LG | 00000 | 080 |
| A3A1J29 | 1251-2422 | 2 | CONNECTOR:PC 12 CONTACT | 91662 | 00-8129-012-603-002 |
| A3A1J30 | 1251-2422 | | CONNECTOR:PC 12 CONTACT | 91662 | D0-8129-012-603-002 |
| A3A1U1 | 0TT54-00150 | 1 | 80ARD:BLANK PC | 28480 | 0TT54-00150 |
| | 0360-1491 | 2T | TERMINAL:SOLDER STUD | 28480 | 0360-1491 |
| | 0403-0063 | 1 | BUMPER:RUBBER BUTTON, PRESS TYPE | 73734 | FSP 115201 |
| A4 | 07754-60170 | | DRIVER AMPL1F1ER(F1G. 6-13) | 28480 | 0TT54-60170 |
| A4C1 | 0180-0106 | 8 | C:FXD ELECT 60 UF 20% 6VDCW | 28480 | 0180-0106 |
| A4C2 | 0180-0106 | | C:FXD ELECT 60 UF 20% 6VDCW | 28480 | 0180-0106 |
| A4C3 | 0160-0154 | 4 | C:FXD NICA NY 0.0022 UF 10% 200VDCW | 56289 | 192P22292-PTS |
| A4C4 | 0160-0165 | 12 | C:FXD MY 0.056 UF 10% 200VDCW | 56289 | 192P56392-PTS |
| A4C5 | 0160-0165 | | C:FXD NV 0.056 UF 10% 200VDCW | 56289 | 192P56392-PTS |
| A4C6 | 0160-0165 | | C:FXD NV 0.056 UF 10% 200VDCW | 56289 | 192P56392-PTS |
| A4CT | | | NOT ASSIGNED | | |
| A4C8 | 0160-0207 | 4 | C:FXD NYLAR 0.01UF 5% 200VDCW | 28480 | 0160-020T |
| A4CR1 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | F03369 |
| A4CR2 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 0T263 | F03369 |
| A4CR3 | 1902-3182 | 8 | DIODE BREAKDOWN:SILICON 12.1V 5% | 28480 | 1902-3182 |
| A4CR4 | 1902-3182 | | DIDDE BREAKDOWN:SILICON 12.1V 5% | 28480 | 1902-3182 |
| A4CR5 | 1901-0033 | | DIDDE:SILICDN 100NA 180WV | 0T263 | F03369 |
| A4MP1 | 07754-20340 | 6 | HEAT SINK | 28480 | 0TT54-20340 |
| | 2190-0759 | 6 | WASHER:FLAT #10 | 00000 | 080 |
| | 2190-0780 | 6 | WASHER:FLAT BLACK FIBER #8 | 00000 | 080 |
| | 2360-0119 | | SCREW:SS7 PAN HD POZ DR 6-32 X T/16" | 00000 | 08D |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | 08D |
| | 2680-015T | 6 | SCREW:PAN HD SLOT DR 10-32 X 2.250"LG | 00000 | 080 |
| A4Q1 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A4Q2 | 1854-0071 | | TSTR:SI NPN(SELECTED FRDM 2N3T04) | 28480 | 1854-00T1 |
| A4Q3 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A4Q4 | 1854-0039 | 4 | TSTR:SI NPN | 80131 | 2N3053 |
| | 1200-0181 | | MOUNTING:TRANSISTOR PAD | 13103 | TT17-5-N |
| A4Q5 | 1853-0066 | | TS7R:SI PNP | 80131 | 2N4250 |
| A4Q6 | 1853-0223 | 4 | 7S7R:SI PNP | 80131 | 2N4902 |
| | 0340-0464 | | INSULA7OR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2190-0007 | 18 | WASHER:INT LOCK #6 | 28480 | 2190-000T |
| | 2360-0201 | 28 | SCREW:SST PHIL POZ1 DR 6-32 X 0.500 | 00000 | D80 |
| | 2500-0001 | | NU7:HEX 6-32 THREAD | 00000 | 08D |
| A40T | 1853-0045 | | TSTR:SI PNP | 80131 | 2N4036 |
| | 1200-0181 | | MOUNTING:TRANSIS7OR PAD | 13103 | 7T17-5-N |
| A4Q8 | 1854-00T1 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A4Q9 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2190-0007 | | WASHER:IN7 LOCK #6 | 28480 | 2190-0007 |
| | 2360-0201 | | SCREW:SST PHIL POZI DR 6-32 X 0.500 | 00000 | 080 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | 080 |
| A4Q10 | 1854-0409 | 4 | 7STR:SI NPN | 80131 | 2N5210 |
| A4Q11 | 1853-0066 | | 7S7R:SI PNP | 80131 | 2N4250 |
| A4Q12 | 1854-0071 | | TS7R:SI NPN(SELECTED FRDM 2N3704) | 28480 | 1854-0071 |
| A4Q13 | 1854-0063 | | 7S7R:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSIS7OR | 13103 | 43-03-1 |
| | 2190-0008 | | WASHER: LOCK NO. 6 | 00000 | 08D |
| | 2360-0201 | | SCREW:SST PHIL POZI DR 6-32 X 0.500 | 00000 | 080 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | 080 |
| A4R1 | 0683-1035 | 22 | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A4R2 | 0698-6909 | 12 | R:FXD FLM 45.3K OHM 0.5% 1/8W | 28480 | 0698-6909 |
| A4R3 | 0757-0452 | 4 | R:FXD MET FLM 2T.4K OHM 1% 1/8W | 28480 | 0757-0452 |
| A4R4 | 0683-6835 | 4 | R:FXD COMP 68K OHM 5% 1/4W | 01121 | CB 6835 |
| A4R5 | 0698-6909 | | R:FXD FLM 45.3K OHM 0.5% 1/8W | 28480 | 0698-6909 |
| A4R6 | 0683-1055 | 4 | R:FXD COMP 1 MEGOHM 5% 1/4W | 01121 | CB 1055 |
| A4RT | 0698-5143 | 4 | R:FXD FLM 395K OHM 0.25% 1/8W | 28480 | 0698-5143 |
| A4R8 | 0683-1035 | | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A4R9 | 2100-2464 | 12 | R:VAR WW 20K OHM 10% 1W | 28480 | 2100-2464 |
| A4R10 | 0698-3136 | 8 | R:FXD MET FLM 1T.8K OHM 1% 2/8W | 19T01 | MF4C T-0 |
| A4R11 | 0683-1035 | | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A4R12 | 0698-3136 | | R:FXD MET FLM 1T.8K OHM 1% 2/8W | 19701 | MF4C T-0 |
| A4R13 | 2100-2464 | | R:VAR WW 20K OHM 10% 1W | 28480 | 2100-2464 |
| A4R14 | 0683-1035 | | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A4R15 | 0698-7382 | 4 | R:FXD FLM 103.5K OHM 0.1% 1/8W | 28480 | 0698-7382 |
| A4R16 | 0683-5635 | 4 | R:FXD COMP 56K OHMS 5% 1/4W | 01121 | CB 5635 |
| A4R17 | 0683-1515 | 14 | R:FXD COMP 150 OHM 5% 1/4W | 01121 | CB 1515 |
| A4R18 | 0686-5605 | 8 | R:FXD COMP 56 OHM 5% 1/2W | 01121 | EB 5605 |
| A4R19 | 0683-1015 | | R:FXD COMP 100 OHM 5% 1/4W | 01121 | CB 1015 |
| A4R20 | 0811-2619 | 4 | R:FXD WW 1.2 OHM 1% 3W | 28480 | 0811-2619 |
| A4R21 | 0761-0026 | 4 | R:FXD MET OX 220 OHM 5% 1W | 28480 | 0T61-0026 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A4R22 | 0686-2715 | 4 | R:FXD COMP 270 OHM 5% 1/2W | 01121 | EB 2715 |
| A4R23 | 0686-1525 | | R:FXD COMP 1500 OHM 5% 1/2W | 01121 | EB 1525 |
| A4R24 | 0686-1825 | 7 | R:FXD COMP 1800 OHM 5% 1/2W | 01121 | EB 1825 |
| A4R25 | 0686-5605 | | R:FXD COMP 56 OHM 5% 1/2W | 01121 | EB 5605 |
| A4R26 | 0683-1515 | | R:FXD COMP 150 OHM 5% 1/4W | 01121 | CB 1515 |
| A4R27 | 0683-1015 | | R:FXD COMP 100 OHM 5% 1/4W | 01121 | CB 1015 |
| A4R28 | 0811-1732 | | R:FXD WW 1 OHM 5% 3W | 28480 | 0811-1732 |
| A4R29 | 0683-2235 | 9 | R:FXD COMP 22K OHM 5% 1/4W | 01121 | CB 2235 |
| A4R30 | 2100-2464 | | R:VAR WW 20K OHM 10% 1W | 28480 | 2100-2464 |
| A4R31 | 0757-0123 | 4 | R:FXD MET FLM 34.8K OHM 1% 1/8W | 28480 | 0757-0123 |
| A4R32 | 0683-2735 | | R:FXD COMP 27K OHM 5% 1/4W | 01121 | CB 2735 |
| A4R33 | 0683-1035 | | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A4R34 | 0683-1025 | 7 | R:FXD COMP 1000 OHM 5% 1/4W | 01121 | CB 1025 |
| A4R36 | 0698-6909 | | R:FXD FLM 45.3K OHM 0.5% 1/8W | 28480 | 0698-6909 |
| A4R37 | 0683-1065 | 4 | R:FXD COMP 10M OHM 5% 1/4W | 01121 | CB 1065 |
| A4R38 | 0757-0869 | 4 | R:FXD MET FLM 681K OHM 1% 1/2W | 28480 | 0757-0869 |
| A4R39 | 0683-2235 | | R:FXD COMP 22K OHM 5% 1/4W | 01121 | CB 2235 |
| A4R40 | 0683-1015 | | R:FXD COMP 100 OHM 5% 1/4W | 01121 | CB 1015 |
| A4R41 | 0683-1515 | | R:FXD COMP 150 OHM 5% 1/4W | 01121 | CB 1515 |
| A4R42 | 0686-3915 | 4 | R:FXD COMP 390 OHM 5% 1/2W | 01121 | EB 3915 |
| A4R43 | 0683-1015 | | R:FXD COMP 100 OHM 5% 1/4W | 01121 | CB 1015 |
| A4R44 | 0811-1732 | | R:FXD WW 1 OHM 5% 3W | 28480 | 0811-1732 |
| A4U1 | 1820-0203 | 8 | IC:OPERATIONAL AMPLIFIER | 07263 | SL8940 |
| A4U2 | 1820-0203 | | IC:OPERATIONAL AMPLIFIER | 07263 | SL8940 |
| A4U3 | 07754-00170 | 4 | BOARD:BLANK PC | 28480 | 07754-00170 |
| A5 | | | SAME AS A4, USE PREFIX A5 | | |
| A6 | | | SAME AS A4, USE PREFIX A6 | | |
| A7 | | | SAME AS A4, USE PREFIX A7 | | |
| A8 | 07754-60180 | 1 | REGULATOR/OSCILLATOR BOARD:60 HZ | 28480 | 07754-60180 |
| A8 | | | (EXCEPT OPT 008, FIG. 6-15) | | |
| A8C1 | 0140-0200 | 4 | C:FXD MICA 390 PF 5% | 72136 | RDM15F391-J3C |
| A8C2 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A8C3 | 0160-2222 | 4 | C:FXD MICA 1500 PF 5% 300VDCW | 28480 | 0160-2222 |
| A8C4 | 0160-0174 | 16 | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C5 | 0180-1830 | 2 | C:FXD ELECT 5.6 UF 10% 35VDCW | 56289 | 150D565X9035B2 OYS |
| A8C6 | 0180-0291 | 4 | C:FXD ELECT 1.0 UF 10% 35VDCW | 56289 | 1500105X9035A2-OYS |
| A8C7 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A8C8 | 0180-0291 | | C:FXD ELECT 1.0 UF 10% 35VDCW | 56289 | 1500105X9035A2-OYS |
| A8C9 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A8C10 | 0160-2891 | 2 | C:FXD MICA 33 PF 2% 500VDCW | 28480 | 0160-2891 |
| A8C11 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A8C12 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C13 | 0160-0161 | 2 | C:FXD MY 0.01 UF 10% 200VDCW | 56289 | 192P10392-PTS |
| A8C14 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C15 | 0140-0200 | | C:FXD MICA 390 PF 5% | 72136 | RDM15F391-J3C |
| A8C16 | 0160-2222 | | C:FXD MICA 1500 PF 5% 300VDCW | 28480 | 0160-2222 |
| A8C17 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C18 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C19 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C20 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A8C21 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A8C22 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8C23 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A8CR1 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | FD3369 |
| A8L1 | 9140-0210 | 2 | COIL/CHOKE 100 UH 5% | 82142 | 15-1315-12J |
| A8MP1 | 07754-20340 | | HEAT SINK | 28480 | 07754-20340 |
| | 2190-0759 | | WASHER:FLAT #10 | 00000 | OBD |
| | 2190-0780 | | WASHER:FLAT BLACK FIBER #8 | 00000 | OBD |
| | 2360-0119 | | SCREW:SST PAN HD POZ DR 6-32 X 7/16" | 00000 | OBD |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| | 2680-0157 | | SCREW:PAN HD SLOT DR 10-32 X 2.250"LG | 00000 | OBD |
| A8Q1 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A8Q2 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A8Q3 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q4 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q5 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2190-0007 | | WASHER:INT LOCK #6 | 28480 | 2190-0007 |
| | 2360-0201 | | SCREW:SST PHIL PDZ1 DR 6-32 X 0.500 | 00000 | OBD |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| A8Q6 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2190-0007 | | WASHER:INT LOCK #6 | 28480 | 2190-0007 |
| | 2360-0201 | | SCREW:SST PHIL PDZ1 DR 6-32 X 0.500 | 00000 | OBD |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | OBD |



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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A8Q7 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q8 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A8Q9 | 1854-0022 | 2 | TSTR:SI NPN | 07263 | S17843 |
| | 1200-0181 | | MOUNTING:TRANSISTOR PAD | 13103 | 7717-5-N |
| A8Q10 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q11 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q12 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2190-0007 | | WASHER:INT LOCK #6 | 28480 | 2190-0007 |
| | 2360-0201 | | SCREW:SST PHIL POZI DR 6-32 X 0.500 | 00000 | 080 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | 080 |
| A8Q13 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q14 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A8Q15 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A8Q16 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A8Q17 | 1853-0045 | | TSTR:SI PNP | 80131 | 2N4036 |
| | 1200-0181 | | MOUNTING:TRANSISTOR PAD | 13103 | 7717-5-N |
| A8R1 | 0698-6338 | 6 | R:FXD FLM 5K OHM 1% 1/8W | 28480 | 0698-6338 |
| A8R2 | 2100-1703 | 2 | R:VAR WW 2K OHM 10% 1W | 28480 | 2100-1703 |
| A8R3 | 0698-5323 | 2 | R:FXD FLM 4K OHM 0.5% 1/8W | 28480 | 0698-5323 |
| A8R4 | 0683-3325 | 4 | R:FXD COMP 3300 OHM 5% 1/4W | 01121 | CB 3325 |
| A8R5 | 0698-4002 | 2 | R:FXD MET FLM 5K OHM 1% 1/8W | 28480 | 0698-4002 |
| A8R6 | 0683-1515 | | R:FXD COMP 150 OHM 5% 1/4W | 01121 | CB 1515 |
| A8R7 | 0683-2725 | 2 | R:FXD COMP 2700 OHM 5% 1/4W | 01121 | CB 2725 |
| A8R8 | 0811-1732 | | R:FXD WW 1 OHM 5% 3W | 28480 | 0811-1732 |
| A8R9 | 0686-1515 | | R:FXD COMP 150 OHM 5% 1/2W | 01121 | EB 1515 |
| A8R10 | 0698-4157 | 2 | R:FXD FLM 10K OHM 0.1% 1/8W | 28480 | 0698-4157 |
| A8R11 | 0757-0442 | 2 | R:FXD MET FLM 10.0K OHM 1% 1/8W | 28480 | 0757-0442 |
| A8R12 | 0698-6338 | | R:FXD FLM 5K OHM 1% 1/8W | 28480 | 0698-6338 |
| A8R13 | 0698-6338 | | R:FXD FLM 5K OHM 1% 1/8W | 28480 | 0698-6338 |
| A8R14 | 0683-4725 | 4 | R:FXD COMP 4700 OHM 5% 1/4W | 01121 | CB 4725 |
| A8R15 | 0811-1732 | | R:FXD WW 1 OHM 5% 3W | 28480 | 0811-1732 |
| A8R16 | 0683-1025 | | R:FXD COMP 1000 OHM 5% 1/4W | 01121 | CB 1025 |
| A8R17 | 0698-6273 | 2 | R:FXD FLM 1500 OHM 0.1% 1/8W | 28480 | 0698-6273 |
| A8R18 | 0698-6866 | 2 | R:FXD FLM 2.182K OHM 0.25% 1/8W | 28480 | 0698-6866 |
| A8R19 | 0698-5323 | | R:FXD FLM 4K OHM 0.5% 1/8W | 28480 | 0698-5323 |
| A8R20 | 0683-4725 | | R:FXD COMP 4700 OHM 5% 1/4W | 01121 | CB 4725 |
| A8R21 | 0683-1245 | 2 | R:FXD COMP 120K OHM 5% 1/4W | 01121 | CB 1245 |
| A8R22 | 0683-5625 | 2 | R:FXD COMP 5600 OHM 5% 1/4W | 01121 | CB 5625 |
| A8R23 | 0683-1005 | 4 | R:FXD COMP 10 OHM 5% 1/4W | 01121 | CB 1005 |
| A8R24 | 0683-1005 | | R:FXD COMP 10 OHM 5% 1/4W | 01121 | CB 1005 |
| A8R25 | 0686-6815 | 1 | R:FXD COMP 680 OHM 5% 1/2W | 01121 | EB 6815 |
| A8R26 | 0811-1830 | 2 | R:FXD WW 0.5 OHM 10% 3W | 28480 | 0811-1830 |
| A8R27 | 0683-2735 | | R:FXD COMP 27K OHM 5% 1/4W | 01121 | CB 2735 |
| A8R28 | 0683-1835 | 2 | R:FXD COMP 18K OHM 5% 1/4W | 01121 | CB 1835 |
| A8R29 | 0683-1825 | 8 | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A8R30 | 0811-1202 | 2 | R:FXD WW 50 OHM 5% 3W | 28480 | 0811-1202 |
| A8R31 | 0683-3335 | 6 | R:FXD COMP 33K OHM 5% 1/4W | 01121 | CB 3335 |
| A8R32 | 0683-3335 | | R:FXD COMP 33K OHM 5% 1/4W | 01121 | CB 3335 |
| A8R33 | 0683-3335 | | R:FXD COMP 33K OHM 5% 1/4W | 01121 | CB 3335 |
| A8R34 | 0683-1035 | | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A8R35 | 0683-3325 | | R:FXD COMP 3300 OHM 5% 1/4W | 01121 | CB 3325 |
| A8R36 | 0683-4715 | | R:FXD COMP 470 OHM 5% 1/4W | 01121 | CB 4715 |
| A8R37 | 0683-1545 | 4 | R:FXD COMP 150K OHM 5% 1/4W | 01121 | CB 1545 |
| A8R38 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A8R39 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A8R40 | 0683-1545 | | R:FXD COMP 150K OHM 5% 1/4W | 01121 | CB 1545 |
| A8R41 | 0683-4715 | | R:FXD COMP 470 OHM 5% 1/4W | 01121 | CB 4715 |
| A8R42 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A8R43 | 0757-0460 | 1 | R:FXD MET FLM 61.9K OHM 1% 1/8W | 28480 | 0757-0460 |
| A8T1 | 07754-60470 | 1 | | | |
| A8U1 | 1826-0010 | 2 | IC:LINEAR, VOLTAGE REGULATOR | 28480 | 1826-0010 |
| A8U2 | 1820-0196 | 2 | IC:LINEAR VOLTAGE REGULATOR(INPUT) | 28480 | 1820-0196 |
| A8J3 | 1820-0056 | 3 | IC:TTL DIVIDE BY 12 10 MHZ MIN. | 01295 | SN7492N |
| A8U4 | 1820-0055 | 5 | IC:TTL DECADE COUNTER 10 MHZ MIN. | 01295 | SN7490N |
| A8U5 | 1820-0056 | | IC:TTL DIVIDE BY 12 10 MHZ MIN. | 01295 | SN7492N |
| A8U6 | 1820-0055 | | IC:TTL DECADE COUNTER 10 MHZ MIN. | 01295 | SN7490N |
| A8U7 | 1820-0430 | 2 | IC:LINEAR, VOLTAGE REGULATOR 5V | 28480 | 1820-0430 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2360-0195 | 4 | SCREW:PAN HD POZI DR 6-32 X 0.312" LG | 00000 | 080 |
| | 2190-0007 | | WASHER:INT LOCK #6 | 28480 | 2190-0007 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | 080 |
| A8U8 | 07754-00180 | 2 | BOARD:BLANK PC | 28480 | 07754-00180 |
| A9 | 07754-60181 | 1 | REGULATOR/OSCILLATOR BOARD:50 HZ (OPT 008, FIG. 6-15) | 28480 | 07754-60181 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A9C1 | 0140-0200 | | C:FXD MICA 390 PF 5% | 72136 | RDM15F391-J3C |
| A9C2 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A9C3 | 0160-2222 | | C:FXD MICA 1500 PF 5% 300VDCW | 28480 | 0160-2222 |
| A9C4 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C5 | 0180-1830 | | C:FXD ELECT 5.6 UF 10% 35VDCW | 56289 | 150D565X9035B2 OYS |
| A9C6 | 0180-0291 | | C:FXD ELECT 1.0 UF 10% 35VDCW | 56289 | 150D105X9035A2-OYS |
| A9C7 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A9C8 | 0180-0291 | | C:FXD ELECT 1.0 UF 10% 35VDCW | 56289 | 150D105X9035A2-OYS |
| A9C9 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A9C10 | 0160-2891 | | C:FXD MICA 33 PF 2% 500VDCW | 28480 | 0160-2891 |
| A9C11 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A9C12 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C13 | 0160-0161 | | C:FXD MY 0.01 UF 10% 200VDCW | 56289 | 192P10392-P7S |
| A9C14 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C15 | 0140-0200 | | C:FXD MICA 390 PF 5% | 72136 | RDM15F391-J3C |
| A9C16 | 0160-2222 | | C:FXD MICA 1500 PF 5% 300VDCW | 28480 | 0160-2222 |
| A9C17 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C18 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C19 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C20 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A9C21 | 0150-0052 | | C:FXD CER 0.05 UF 20% 400VDCW | 56289 | 33C17A |
| A9C22 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9C23 | 0160-0174 | | C:FXD CER 0.47 UF +80-20% 25VDCW | 56289 | 5C1187S-CML |
| A9CR1 | 1901-0033 | | DIODE:SILICON 100MA 180WV | 07263 | F03369 |
| A9L1 | 9140-0210 | | COIL/CHOKE 100 UH 5% | 82142 | 15-1315-12J |
| A9MP1 | 07754-20340 | | HEAT SINK | 28480 | 07754-20340 |
| | 2190-0759 | | WASHER:FLAT #10 | 00000 | D8D |
| | 2190-0780 | | WASHER:FLAT BLACK FIBER #8 | 00000 | D80 |
| | 2360-0119 | | SCREW:SST PAN HD PDZ DR 6-32 X 7/16" | 00000 | D80 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | D80 |
| | 2680-0157 | | SCREW:PAN HD SLOT DR 10-32 X 2.250"LG | 00000 | D8D |
| A9Q1 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A9Q2 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A9Q3 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q4 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q5 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2360-0201 | | SCREW:SST PHIL PDZI DR 6-32 X 0.500 | 00000 | D8D |
| | 2190-0007 | | WASHER: LOCK NO. 6 | 00000 | D80 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | D8D |
| A9Q6 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2360-0201 | | SCREW:SST PHIL PDZI DR 6-32 X 0.500 | 00000 | D80 |
| | 2190-0008 | | WASHER:SPLIT LOCK #6 | 00000 | D80 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | D8D |
| A9Q7 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q8 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A9Q9 | 1854-0022 | | TSTR:SI NPN | 07263 | S17843 |
| | 1200-0181 | | MOUNTING:TRANSISTOR PAD | 13103 | 7717-5-N |
| A9Q10 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q11 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q12 | 1854-0063 | | TSTR:SI NPN | 80131 | 2N3055 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2360-0201 | | SCREW:SST PHIL PDZI DR 6-32 X 0.500 | 00000 | D80 |
| | 2190-0007 | | WASHER: LOCK NO. 6 | 00000 | D80 |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | D80 |
| A9Q13 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q14 | 1854-0071 | | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480 | 1854-0071 |
| A9Q15 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A9Q16 | 1853-0066 | | TSTR:SI PNP | 80131 | 2N4250 |
| A9Q17 | 1853-0045 | | TSTR:SI PNP | 80131 | 2N4036 |
| | 1200-0181 | | MOUNTING:TRANSISTOR PAD | 13103 | 7717-5-N |
| A9R1 | 0698-6338 | | R:FXD FLM 5K OHM 1% 1/8W | 28480 | 0698-6338 |
| A9R2 | 2100-1703 | | R:VAR WW 2K OHM 10% 1W | 28480 | 2100-1703 |
| A9R3 | 0698-5323 | 2 | R:FXD FLM 4K OHM 0.5% 1/8W | 19701 | MF4C T-2 |
| A9R4 | 0683-3325 | | R:FXD COMP 3300 OHM 5% 1/4W | 01121 | CB 3325 |
| A9R5 | 0698-4002 | | R:FXD MET FLM 5K OHM 1% 1/8W | 28480 | 0698-4002 |
| A9R6 | 0683-1515 | | R:FXD COMP 150 OHM 5% 1/4W | 01121 | CB 1515 |
| A9R7 | 0683-2725 | | R:FXD COMP 2700 OHM 5% 1/4W | 01121 | CB 2725 |
| A9R8 | 0811-1732 | | R:FXD WW 1 OHM 5% 3W | 28480 | 0811-1732 |
| A9R9 | 0686-1515 | | R:FXD COMP 150 OHM 5% 1/2W | 01121 | EB 1515 |
| A9R10 | 0698-4157 | | R:FXD FLM 10K OHM 0.1% 1/8W | 28480 | 0698-4157 |
| A9R11 | 0757-0442 | | R:FXD MET FLM 10.0K OHM 1% 1/8W | 28480 | 0757-0442 |
| A9R12 | 0698-6338 | | R:FXD FLM 5K OHM 1% 1/8W | 28480 | 0698-6338 |
| A9R13 | 0698-6338 | | R:FXD FLM 5K OHM 1% 1/8W | 28480 | 0698-6338 |
| A9R14 | 0683-4725 | | R:FXD COMP 4700 OHM 5% 1/4W | 01121 | CB 4725 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A9R15 | 0811-1732 | | R:FXD WW 1 OHM 5% 3W | 28480 | 0811-1732 |
| A9R16 | 0683-1025 | | R:FXD COMP 1000 OHM 5% 1/4W | 01121 | CB 1025 |
| A9R17 | 0698-6273 | | R:FXD FLM 1500 OHM 0.1% 1/8W | 28480 | 0698-6273 |
| A9R18 | 0698-6866 | | R:FXD FLM 2.182K OHM 0.25% 1/8W | 28480 | 0698-6866 |
| A9R19 | 0698-5323 | | R:FXD FLM 4K OHM 0.5% 1/8W | | MF4C T-2 |
| A9R20 | 0683-4725 | | R:FXD COMP 4700 OHM 5% 1/4W | 01121 | CB 4725 |
| A9R21 | 0683-1245 | | R:FXD COMP 120K OHM 5% 1/4W | 01121 | CB 1245 |
| A9R22 | 0683-5625 | | R:FXD COMP 5600 OHM 5% 1/4W | 01121 | CB 5625 |
| A9R23 | 0683-1005 | | R:FXD COMP 10 OHM 5% 1/4W | 01121 | CB 1005 |
| A9R24 | 0683-1005 | | R:FXD COMP 10 OHM 5% 1/4W | 01121 | CB 1005 |
| A9R25 | 0683-1025 | | R:FXD COMP 1000 OHM 5% 1/4W | 01121 | CB 1025 |
| A9R26 | 0811-1830 | | R:FXD WW 0.5 OHM 10% 3W | 28480 | 0811-1830 |
| A9R27 | 0683-1835 | | R:FXD COMP 18K OHM 5% 1/4W | 01121 | CB 1835 |
| A9R28 | 0683-2235 | | R:FXD COMP 22K OHM 5% 1/4W | 01121 | CB 2235 |
| A9R29 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A9R30 | 0811-1202 | | R:FXD WW 50 OHM 5% 3W | 28480 | 0811-1202 |
| A9R31 | 0683-3335 | | R:FXD COMP 33K OHM 5% 1/4W | 01121 | CB 3335 |
| A9R32 | 0683-3335 | | R:FXD COMP 33K OHM 5% 1/4W | 01121 | CB 3335 |
| A9R33 | 0683-3335 | | R:FXD COMP 33K OHM 5% 1/4W | 01121 | CB 3335 |
| A9R34 | 0683-1035 | | R:FXD COMP 10K OHM 5% 1/4W | 01121 | CB 1035 |
| A9R35 | 0683-3325 | | R:FXD COMP 3300 OHM 5% 1/4W | 01121 | CB 3325 |
| A9R36 | 0683-4715 | | R:FXD COMP 470 OHM 5% 1/4W | 01121 | CB 4715 |
| A9R37 | 0683-1545 | | R:FXD COMP 150K OHM 5% 1/4W | 01121 | CB 1545 |
| A9R38 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A9R39 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A9R40 | 0683-1545 | | R:FXD COMP 150K OHM 5% 1/4W | 01121 | CB 1545 |
| A9R41 | 0683-4715 | | R:FXD COMP 470 OHM 5% 1/4W | 01121 | CB 4715 |
| A9R42 | 0683-1825 | | R:FXD COMP 1800 OHM 5% 1/4W | 01121 | CB 1825 |
| A9T1 | 9100-2353 | 1 | TRANSFORMER:OSCILLATOR | 28480 | 9100-2353 |
| A9U1 | 1826-0010 | | IC:LINEAR, VOLTAGE REGULATOR | 28480 | 1826-0010 |
| A9U2 | 1820-0196 | | IC:LINEAR VOLTAGE REGULATOR(INPUT) | 28480 | 1820-0196 |
| A9U3 | 1820-0055 | | IC:TTL DECADE COUNTER 10 MHZ MIN. | 01295 | SN7490N |
| A9U4 | 1820-0055 | | IC:TTL DECADE COUNTER 10 MHZ MIN. | 01295 | SN7490N |
| A9U5 | 1820-0056 | | IC:TTL DIVIDE BY 12 10 MHZ MIN. | 01295 | SN7492N |
| A9U6 | 1820-0055 | | IC:TTL DECADE COUNTER 10 MHZ MIN. | 01295 | SN7490N |
| A9U7 | 1820-0430 | | IC:LINEAR, VOLTAGE REGULATOR 5V | 28480 | 1820-0430 |
| | 0340-0464 | | INSULATOR FOR TO-3 TRANSISTOR | 13103 | 43-03-1 |
| | 2360-0195 | | SCREW:PAN HD POZI DR 6-32 X 0.312" LG | 00000 | OBD |
| | 2190-0008 | | WASHER:SPLIT LOCK #6 | 00000 | OBD |
| | 2500-0001 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| A9U8 | 07754-00180 | | BOARD:BLANK PC | 28480 | 07754-00180 |
| A10 | 07754-60250 | | DRIVE UNIT(FIG. 6-16) | 28480 | 07754-60250 |
| | 2510-0053 | 4 | SCREW:PAN HD POZI DR 8-32 X 0.750" LG | 00000 | OBD |
| A10B1 | 3140-0337 | 1 | MOTOR:450 RPM 60HZ (EXCEPT OPTION 08) | 28480 | 3140-0337 |
| | 1400-0017 | | CLAMP,CABLE NYLON 5/16 | 71616 | CPC-1953-58 |
| | 2510-0121 | 2 | SCREW:FLAT HD POZI DR 8-32 X 0.375"LG | 00000 | OBD |
| | 2580-0006 | | NUT:HEX 8-32 THREAD | 78189 | KEP511-081800-00 |
| A10C1 | 0160-3614 | 1 | C:PAPER AND OIL | 28480 | 0160-3614 |
| A10E1 | 0360-1289 | 2 | BARRIER BLOCK:2 TERMINALS | 98410 | 35002-3523 |
| | 0360-1279 | 1 | TERMINAL:JUMPER FOR #6 SCREW | 00000 | OBD |
| | 2360-0123 | | SCREW:SST PAN HD POZ DR 6-32 X 5/8" | 00000 | OBD |
| | 2480-0006 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| A10MP1 | 1430-0451 | 1 | SPROCKET:20 TOOTH, 3/16 PITCH (60 HZ UNITS ONLY) | 28480 | 1430-0451 |
| A10MP2 | 1460-0798 | 2 | SPRING:COMPRESSION | 00000 | OBD |
| A10MP3 | 1460-1227 | 1 | SPRING:PRESSURE | 28480 | 1460-1227 |
| A10MP4 | 1460-1228 | 1 | SPRING:PRESSURE | 28480 | 1460-1228 |
| A10MP5 | 1500-0290 | 1 | SPROCKET:25 TOOTH | 28480 | 1500-0290 |
| A10MP6 | 1500-0294 | 1 | CHAIN DRIVE:0.188" PITCH | 28480 | 1500-0294 |
| A10MP7 | 1500-0295 | 1 | CHAIN DRIVE:0.188" PITCH | 28480 | 1500-0295 |
| A10MP8 | 07754-00110 | 1 | TRAY | 28480 | 07754-00110 |
| | 2510-0121 | | SCREW:FLAT HD POZI DR 8-32 X 0.375"LG | 00000 | OBD |
| A10MP9 | 07754-00220 | 1 | TABLE | 28480 | 07754-00220 |
| A10MP10 | 07754-00210 | 1 | LINK:TABLE | 28480 | 07754-00210 |
| A10MP11 | 07754-00261 | 1 | PLATE:SIDE, RIGHT | 28480 | 07754-00261 |
| A10MP12 | 07754-00330 | 1 | ARM:PIVOT | 28480 | 07754-00330 |
| A10MP13 | 07754-00350 | 1 | GUIDE:PAPER | 28480 | 07754-00350 |
| | 2200-0164 | 2 | SCREW:FLAT HD POZI 4-40 X 3/16 | 00000 | OBD |
| A10MP14 | 07754-00610 | 1 | CHASSIS | 28480 | 07754-00610 |
| | 2510-0045 | | SCREW:PAN HD POZI DR 8-32 X 0.375" LG | 00000 | OBD |
| A10MP15 | 07754-00630 | 1 | BRAKE ARM | 28480 | 07754-00630 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A10MP16 | 07754-00680 | 1 | FELT:BRAKE | 28480 | 07754-00680 |
| A10MP17 | 07754-00800 | 1 | RETAINER:ROD, PAPER TABLE | 28480 | 07754-00800 |
| A10MP18 | 07754-00700 | 1 | PLATE:SHIM | 28480 | 07754-00700 |
| A10MP19 | 07754-00730 | 3 | GUIDE | 28480 | 07754-00730 |
| | 2360-0117 | | SCREW:PAN HD POZI 6-32 X 3/8 W/LK | 00000 | OBD |
| | 2480-0006 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| A10MP20 | 07754-00790 | 2 | SPRING:BRAKE, LEAF TYPE | 28480 | 07754-00790 |
| | 0520-0174 | 5 | SCREW:PAN HD POZI DR 2-56 X 0.250" LG | 00000 | OBD |
| | 0610-0002 | 6 | NUT:HEX, BRASS 2-56 THREAD | 00000 | OBD |
| A10MP21 | 07754-20280 | 1 | CLAMP:FELT | 28480 | 07754-20280 |
| | 2360-0182 | | SCREW:FLAT HD POZI DR 6-32 X 0.312" LG | 00000 | OBD |
| A10MP22 | 07754-20360 | 1 | MOUNT:GALVANOMETER | 28480 | 07754-20360 |
| | 2360-0183 | 4 | SCREW:FLAT HD POZI DR 6-32 X 0.375"LG | 00000 | OBD |
| A10MP23 | 07754-20510 | 1 | STRIP NUT(BAR) | 28480 | 07754-20510 |
| A10MP24 | 07754-20400 | 1 | SHAFT | 28480 | 07754-20400 |
| A10MP25 | 07754-20410 | 1 | ROD | 28480 | 07754-20410 |
| | 0510-0053 | 2 | RING:RETAINING FOR 0.188" DIA SHAFT | 79136 | 5555-18-S-MD |
| A10MP26 | 07754-20430 | 2 | SPACER | 28480 | 07754-20430 |
| A10MP27 | 07754-20440 | 1 | SHAFT | 28480 | 07754-20440 |
| A10MP28 | 07754-20470 | 1 | SHAFT | 28480 | 07754-20470 |
| A10MP29 | 07754-20480 | 1 | SHAFT | 28480 | 07754-20480 |
| | 0510-0053 | | RING:RETAINING FOR 0.188" DIA SHAFT | 79136 | 5555-18-S-MD |
| A10MP30 | 07754-20500 | 2 | BEARING | 28480 | 07754-20500 |
| A10MP31 | 07754-20510 | 1 | STRIP NUT(BAR) | | |
| A10MP32 | 07754-20520 | 2 | SCREW:ADJUSTMENT | 28480 | 07754-20520 |
| A10MP33 | 07754-20530 | 4 | SPACER:MOTOR MOUNTING, PLASTIC | 28480 | 07754-20530 |
| A10MP34 | 07754-20590 | 1 | KEY:SHAFT | 28480 | 07754-20590 |
| A10MP35 | 07754-20660 | 1 | SPACER | 28480 | 07754-20660 |
| | 2360-0117 | | SCREW:PAN HD POZI 6-32 X 3/8 W/LK | 00000 | OBD |
| A10MP36 | 07754-20700 | 1 | BLOCK:GUARD | 28480 | 07754-20700 |
| | 2200-0107 | | SCREW:POZI DR 4-40 X 3/8 W/LOCK | 00000 | OBD |
| A10MP37 | 07754-20750 | 1 | BAR:BRAKE | 28480 | 07754-20750 |
| | 2200-0166 | | SCREW:SST FLAT HD POZI DR 4-40 X 0.312" | 00000 | OBD |
| A10MP38 | 07754-00810 | 1 | SPRING, TABLE | 28480 | 07754-00810 |
| | 0520-0174 | | SCREW:PAN HD POZI DR 2-56 X 0.250" LG | 00000 | OBD |
| A10MP39 | 07754-20800 | 1 | PAD:MOTOR | 28480 | 07754-20800 |
| A10MP40 | 07754-60300 | 1 | ROLLER:PRESSURE | 28480 | 07754-60300 |
| A10MP41 | 07754-60400 | 1 | PANEL:LEFT | 28480 | 07754-60400 |
| A10MP42 | 07754-00850 | 1 | COVER | 28480 | 07754-00850 |
| | 2200-0103 | | SCREW:SST PHH POZI DR 4-40 X 1/4"W/LK | 00000 | OBD |
| A10MP43 | 07754-00820 | 1 | PLATEN | 28480 | 07754-00820 |
| A10MP44 | 07754-20380 | 1 | ROLLER:DRIVE | 28480 | 07754-20380 |
| | 2190-0736 | 1 | WASHER:FLAT FOR 3/8" HDW | 00000 | OBD |
| | 2190-0754 | 1 | WASHER:FLAT FOR 3/8" HDW | 00000 | OBD |
| A10P9 | 8120-0962 | 1 | PLUG:2 CONTACT M, MOTOR | 28480 | 8120-0962 |
| A10W1 | 07754-60200 | 1 | CABLE:INTERLOCK | 28480 | 07754-60200 |
| | 1400-0082 | 2 | CLAMP:CABLE 3/8" WIDE | 09922 | HP-2N |
| | 2360-0115 | 13 | SCREW:PAN HD POZI 6-32 X 5/16 W/LK | 00000 | OBD |
| | 2360-0182 | | SCREW:FLAT HD POZI DR 6-32 X 0.312" LG | 00000 | OBD |
| | 2480-0006 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| A10XC1 | 0160-2729 | 2 | BRACKET:CAPACITOR, CADMIUM PLATED | 14655 | 30744-36 |
| | 2740-0003 | 2 | NUT:HEX STL 10-32 X 3/8 | 78189 | 510-101810-51 |
| A10A1 | 07754-60040 | | GEARBOX(FIG. 6-17) | 28480 | 07754-60040 |
| | 2360-0121 | 4 | SCREW:POZI DR 6-32 X 1/2" W/LOCK | 00000 | OBD |
| A10A1MP1 | 1410-0974 | 2 | BEARING:BALL, RADIAL | 21335 | 57KDD |
| A10A1MP2 | 1460-1210 | 4 | SPRING:TORSION | 28480 | 1460-1210 |
| A10A1MP3 | 1460-1211 | 4 | SPRING:TORSION | 28480 | 1460-1211 |
| A10A1MP4 | 1500-0288 | 1 | GEAR:SPROCKET 20 TOOTH | 28480 | 1500-0288 |
| | 2510-0185 | 4 | SCREW:FLAT HD POZI DR 8-32 X 0.437" LG | 00000 | OBD |
| A10A1MP5 | 1500-0291 | 1 | GEAR:SPROCKET 36 TOOTH | 28480 | 1500-0291 |
| A10A1MP6 | 07754-00590 | 1 | COVER | 28480 | 07754-00590 |
| | 2360-0115 | | SCREW:PAN HD POZI 6-32 X 5/16 W/LK | 00000 | OBD |
| A10A1MP7 | 07754-20060 | 1 | GEAR:52 TOOTH | 28480 | 07754-20060 |
| A10A1MP8 | 07754-20070 | 2 | GEAR:104 TOOTH | 28480 | 07754-20070 |
| A10A1MP9 | 07754-20080 | 2 | GEAR:78 TOOTH | 28480 | 07754-20080 |
| A10A1MP10 | 07754-20090 | 1 | GEAR:52 AND 78 TOOTH | 28480 | 07754-20090 |
| A10A1MP11 | 07754-20100 | 1 | GEAR:36 AND 78 TOOTH | 28480 | 07754-20100 |
| A10A1MP12 | 07754-20110 | 2 | GEAR:120 TOOTH | 28480 | 07754-20110 |
| A10A1MP13 | 07754-20120 | 2 | GEAR:39 TOOTH | 28480 | 07754-20120 |
| A10A1MP14 | 07754-20130 | 2 | GEAR:36 AND 117 TOOTH | 28480 | 07754-20130 |
| A10A1MP15 | 07754-20140 | 1 | GEAR:120 TOOTH | 28480 | 07754-20140 |
| A10A1MP16 | 07754-20190 | 2 | SHAFT:INPUT OR OUTPUT | 28480 | 07754-20190 |
| | 2190-0763 | 2 | WASHER:FLAT #6 HDW | 00000 | OBD |
| | 0570-1009 | 2 | SCREW:SHOULDER PAN HD SLOT OR 4-40 THD | 00000 | OBD |
| A10A1MP17 | 07754-20230 | 2 | PLATE:SIDE | 28480 | 07754-20230 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| | 2200-0113 | | SCREW:PAN HD POZ1 DR 4-40 X 0.625" LG | 00000 | OBD |
| A10A1MP18 | 07754-20390 | 2 | LOCKNUT:SHAFT END PLAY | 28480 | 07754-20390 |
| | 3030-0441 | 2 | SCREW:SET 4-40 X 0.625" LG | 08664 | OBD |
| | 01250-21101 | 2 | SPACER: SHAFT LOCK NUT | | |
| A10A1MP19 | 07754-20720 | 2 | COUPLING | 28480 | 07754-20720 |
| A10A1MP20 | 0490-0957 | 4 | RELAY:ACTUATOR | 28480 | 0490-0957 |
| | 2200-0113 | 8 | SCREW:PAN HD POZ1 DR 4-40 X 0.625" LG | 00000 | OBD |
| A10A1MP21 | 07754-20760 | 1 | HUB:SPROCKET | 28480 | 07754-20760 |
| | 0570-0174 | 2 | SCREW:SET SOCKET DR 8-32 X 0.250" LG | 00000 | OBD |
| A10A1MP22 | 07754-60420 | 1 | ASSY:COLLAR | 28480 | 07754-60420 |
| A10A1MP23 | 07754-40010 | 4 | CLUTCH | 28480 | 07754-40010 |
| A10A1MP24 | 07754-60280 | 1 | ASSY:CABLE | 28480 | 07754-60280 |
| | 2190-0833 | 2 | WASHER:FLAT 5/16" DIA SHAFT | 00000 | OBD |
| A10A1MP25 | 07754-00840 | 4 | SPACER:SOLENOID | 28480 | 07754-00840 |
| | 2200-0101 | 6 | SCREW:PAN HD POZ1 4-40 X 3/16 W/LK | 00000 | OBD |
| A10A1MP26 | 07754-00880 | 4 | SPRING, SOLENOID ADJUSTMENT | 28480 | 07754- |
| | 2200-0111 | 4 | SCREWS, PAN HD POZI 4-40 x 0.5 IN LG | 00000 | OBD |
| A11 | 07754-60070 | | GALVANOMETER(FIG. 6-18) | 28480 | 07754-60070 |
| | 2680-0055 | | SCREW:SST PAN HD POZ1 DR 10-32 X 0.500" | 00000 | OBD |
| A11MP1 | 07754-20630 | 4 | ARM:PIVOT | 28480 | 07754-20630 |
| | 3030-0044 | 4 | SCREW:SOCKET CAP 2-56 X 0.375" | 70276 | OBD |
| A11MP2 | 07754-00550 | 4 | CLIP:STYLUS RETAINER | 28480 | 07754-00550 |
| A11MP3 | 07754-20600 | 8 | STYLUS BUMPER | 28480 | 07754-20600 |
| A11MP4 | 07754-20600 | | STYLUS BUMPER | 28480 | 07754-20600 |
| A11MP5 | 07754-00390 | 4 | RETAINER:BUMPER | 28480 | 07754-00390 |
| | 2340-0006 | 8 | NUT:HEX 4-40 X 0.250" ACROSS FLAT | 00000 | OBD |
| | 2200-0105 | | SCREW:PAN HD POZ1 DR 4-40 X 0.312" LG | 00000 | OBD |
| | 3050-0269 | 4 | WASHER:FLAT #5 HDW | 00000 | OBD |
| A11MP6 | 07754-60430 | 4 | PIVOT, TAIL | 28480 | 07754-60430 |
| | 0520-0173 | 4 | SCREW:PAN HD POZI DR 2-56 X 0.188" LG | 00000 | OBD |
| | 0610-0002 | | NUT:HEX, BRASS 2-56 THREAD | 00000 | OBD |
| A11MP7 | 07754-00040 | 4 | ARM:STYLUS PRESSURE ADJUSTING | 28480 | 07754-00040 |
| | 2360-0107 | 4 | SCREW:PAN HD PHIL DR 6-32 X 1.875" LG | 00000 | OBD |
| | 2360-0111 | 4 | SCREW:PAN HD POZ1 DR 6-32 X 0.188" LG | 00000 | OBD |
| A11MP8 | 07754-00480 | 4 | PLATE,SPACER | 28480 | 07754-00480 |
| A11W1 | 07754-60080 | 4 | CABLE:GALVANOMETER | 28480 | 07754-60080 |
| A11W1MP1 | 07754-00650 | 4 | BRACKET:CONNECTOR | 28480 | 07754-00650 |
| | 0360-1045 | 4 | LUG:SOLDER FOR #4 SCREW | 00000 | OBD |
| | 1400-0017 | | CLAMP,CABLE NYLON 5/16 | 71616 | CPC-1953-58 |
| | 2200-0109 | 4 | SCREW:PAN HD POZ1 DR 4-40 X 0.438" LG | 00000 | OBD |
| | 2340-0006 | | NUT:HEX 4-40 X 0.250" ACROSS FLAT | 00000 | OBD |
| | 2360-0115 | | SCREW:PAN HD POZ1 6-32 X 5/16 W/LK | 00000 | OBD |
| | 2420-0006 | | NUT:HEX 6-32 THREAD | 00000 | OBD |
| A11W1P1 | 1251-0198 | | CONNECTOR:PC EDGE (2 X 6) 12 CONTACT | 71785 | 251-06-30-261 |
| A12 | | | SAME AS A11, USE PREFIX A12 | | |
| A13 | | | SAME AS A11, USE PREFIX A13 | | |
| A14 | | | SAME AS A11, USE PREFIX A14 | | |
| A15 | 07754-60350 | | MARKER(FIG. 6-19) | 28480 | 07754-60350 |
| | 2200-0105 | | SCREW:PAN HD POZ1 DR 4-40 X 0.312" LG | 00000 | OBD |
| | 0550-0045 | 2 | SCREW:SST PAN HD SLOT DR 5-40 X 0.125" | 00000 | OBD |
| | 0380-0787 | 2 | STANDOFF:INSULATED, HEX BASE | 00000 | OBD |
| | 2190-0007 | | WASHER:INT LOCK #6 | 28480 | 2190-0007 |
| | 2200-0165 | | SCREW:FLAT HD POZ1 DR 4-40 X 1/4" | 00000 | OBD |
| | 0520-0185 | 2 | SCREW:PAN HD POZ1 DR 2-56 X 0.125" LG | 00000 | OBD |
| | 2200-0071 | 2 | SCREW:FIL HD SLOT DR 4-40 X 0.125" LG | 00000 | OBD |
| | 2200-0101 | | SCREW:PAN HD POZ1 4-40 X 3/16 W/LK | 00000 | OBD |
| A15L1 | 0490-0417 | 2 | RELAY:24V 3A @ 115 VAC | 77342 | KS-1087-1 |
| A15MP1 | 07754-00440 | 2 | BRACKET:MARKER | 28480 | 07754-00440 |
| A15MP2 | 07754-00450 | 2 | BRACKET:MARKER | 28480 | 07754-00450 |
| A15MP3 | 07754-00830 | 2 | BRACKET:LIMIT | 28480 | 07754-00830 |
| A15MP4 | 07754-60310 | 2 | PEN:MARKER | 28480 | 07754-60310 |
| A15W1 | 07754-60360 | 2 | CABLE:MARKER | 28480 | 07754-60360 |
| A16 | | | MARKER, TIMED, SAME AS A15, USE PREFIX A16 | | |
| A17 | 868-500AC13 | | OSCILLATOR:2400 HZ(OPT 004, FIG. 6-20) | 28480 | 868-500AC13 |
| A17C18 | 0160-2838 | 1 | C:FXD PAPER 0.33 UF 10% | 28480 | 0160-2838 |
| A17C19 | 0160-2771 | 1 | C:FXD MY 0.022 UF 10% 200VDCW | 14655 | WMF2522 |
| A17C21 | 0160-0158 | 1 | C:FXD MY 0.0056 UF 10% 200VDCW | 56289 | 192P56292-PTS |
| A17CR24 | 1902-0551 | 1 | DIODE BREAKDOWN:6.19V 5% | 28480 | 1902-0551 |
| A17CR25 | 1901-0026 | 4 | DIODE:SILICON 0.75A 200PIV | 04713 | SR1358-8 |
| A17CR26 | 1901-0026 | | DIODE:SILICON 0.75A 200PIV | 04713 | SR1358-8 |
| A17MP1 | 801-157 | 2 | BRACKET | 28480 | 801-157 |
| A17Q19 | 1853-0045 | | TSTR:SI PNP | 80131 | 2N4036 |
| | 1205-0095 | 1 | HEAT SINK:TRANSISTOR | 13103 | 22258 |
| A17Q20 | 1850-0180 | 2 | TSTR:GE PNP | 80131 | 2N1374 |
| A17Q21 | 1850-0180 | | TSTR:GE PNP | 80131 | 2N1374 |
| A17R37 | 0686-6825 | 2 | R:FXD COMP 6800 OHMS 5% 1/2W | 01121 | EB 6825 |
| A17R38 | 0686-1005 | 1 | R:FXD COMP 10 OHM 5% 1/2W | 01121 | EB 1005 |
| A17R39 | 0686-6825 | | R:FXD COMP 6800 OHMS 5% 1/2W | 01121 | EB 6825 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| A17R40 | 0686-5615 | 2 | R:FXD COMP 560 OHM 5% 1/2W | 01121 | EB 5615 |
| A17R41 | 0686-5615 | | R:FXD COMP 560 OHM 5% 1/2W | 01121 | EB 5615 |
| A17R42 | 0686-4715 | 2 | R:FXD COMP 470 OHM 5% 1/2W | 01121 | EB 4715 |
| A17R43 | 0686-4715 | | R:FXD COMP 470 OHM 5% 1/2W | 01121 | EB 4715 |
| A17TT | 9100-1990 | 1 | TRANSFORMER:TOROIDAL OSC. | 28480 | 9100-1990 |
| | 710P-1 | 1 | WASHER | 28480 | 710P-1 |
| | 0360-1491 | | TERMINAL:SOLDER STUD | 28480 | 0360-1491 |
| | 0362-0215 | 8 | TERMINATION:CRIMP TYPE FOR 0.058" DIA | 00779 | 60598-6 |
| A17TMT | 083T-0037 | 2 | THERMISTOR:310 OHM 10% | 83186 | 23E3 |
| A17TM8 | 0837-0037 | | THERMISTOR:310 OHM 10% | 83186 | 23E3 |
| A17U1 | T52-353 | 1 | BOARD:BLANK PC | 28480 | T52-353 |
| A18 | 868-500AC14 | 1 | OSCILLATOR:440 NZ(OPT 005, FIG. 6-21) | 28480 | 868-500AC14 |
| A18C15 | 0160-2835 | 1 | C:FXD PAPER 2 UF 20% | 28480 | 0160-2835 |
| A18C16 | 0180-0183 | 2 | C:FXD AL ELECT 10 UF +75-10% 50VDCW | 56289 | 300106G050CB2-DSM |
| A18C1T | 0180-0183 | | C:FXD AL ELECT 10 UF +75-10% 50VDCW | 56289 | 300106G050CB2-DSM |
| A18CR21 | 1901-0026 | | DIODE:SILICON 0.75A 200PIV | 04T13 | SK1358-8 |
| A18CR22 | 1901-0026 | | DIODE:SILICON 0.75A 200PIV | 04713 | SR1358-8 |
| A18CR23 | 1902-0202 | 1 | DIODE BREAKDOWN:15.0V 5% 1W | 28480 | 1902-0202 |
| A18MP1 | 801-157 | | BRACKET | 28480 | 801-157 |
| A18Q12 | 1850-0181 | 2 | TSTR:GE PNP | 80131 | 2N2552 |
| A18Q13 | 1850-0181 | | TSTR:GE PNP | 80131 | 2N2552 |
| A18R21 | 0686-1815 | 2 | R:FXD COMP 180 OHM 5% 1/2W | 01121 | EB 1815 |
| A18R22 | 0811-1983 | 1 | R:FXD WW 7.5 OHM 5% 3W | 28480 | 0811-1983 |
| A18R23 | 0686-1825 | | R:FXD COMP 1800 OHM 5% 1/2W | 01121 | EB 1825 |
| A18R24 | 0686-1825 | | R:FXD COMP 1800 OHM 5% 1/2W | 01121 | EB 1825 |
| A18R25 | 0686-1815 | | R:FXD COMP 180 OHM 5% 1/2W | 01121 | EB 1815 |
| A18R26 | 0686-1825 | | R:FXD COMP 1800 OHM 5% 1/2W | 01121 | EB 1825 |
| A18R27 | 0686-1025 | 1 | R:FXD COMP 1000 OHM 5% 1/2W | 01121 | EB 1025 |
| A18T4 | 9100-1967 | 1 | TRANSFORMER:TOROIDAL OSC. | 28480 | 9100-1967 |
| | 0340-0197 | 1 | INSULATOR:WAFER FOR #8 HDW MTG. | 76530 | 294832 |
| | 1200-0080 | 1 | INSULATOR:TRANSISTOR MTG. | 71T85 | 294834 |
| A18U1 | T52-363 | 1 | BOARD:BLANK PC | 28480 | T52-363 |
| A19 | 07754-63499 | | ACCESSORIES(FIG. 6-22) | 28480 | 0TT54-63499 |
| A19MP1 | 2110-0305 | 1 | FUSE:1.25 AMP SLOW BLOW (FOR 230V SERVICE) | 71400 | MDX-1-1/4A |
| A19MP2 | 2110-0380 | 1 | FUSE:2.5 AMP AT 250 V SLOW-BLOW | 71400 | MDA-2-1/2 |
| A19MP3 | 2110-0381 | 1 | FUSE:3.0 AMP AT 250V SLOW-BLOW | 71400 | MDA 3 |
| A19MP4 | 2110-0386 | 1 | FUSE:6 AMP AT 250V | T1400 | ABC-6-A |
| A19MP5 | 5060-4641 | 1 | KIT:MONITOR CONNECTOR | 28480 | 5060-4641 |
| A19MP6 | 5060-4642 | 1 | KIT:PWR/REMOTE CONNECTOR | 28480 | 5060-4642 |
| A19MPT | 6040-0220 | 1 | OIL:TURBINE 3/4 OZ. | 0T829 | K674L017 |
| A19MP8 | 6040-0222 | 1 | LUBRICANT(1 OZ.) | 00000 | 080 |
| A19MP9 | 8120-1395 | 1 | CABLE ASSY:AC POWER CORD(8 FT) | 70903 | KN-7077 |
| A19MP10 | 8T10-0865 | 1 | WRENCH:ALLEN, HEX KEY | 00000 | 080 |
| A19MP11 | 8710-0875 | 1 | SCREWDRIVER | 00000 | 080 |
| A19MP12 | 0T754-00T60 | 1 | LATCH:CABLE | 28480 | 0T754-00T60 |
| A19MP13 | 07414-91999 | 1 | MANUAL:OPERATING AND SERVICE | 28480 | 07414-91999 |
| A19MP14 | 07850-01520 | 5 | PAPER:STYLUS LAPPING | 28480 | 07850-01520 |
| A19MP15 | 14023A | 1 | TESTER:STYLUS PRESSURE | 28480 | 14023A |
| A19MP16 | 9270-0878 | 1 | PERMAPAPER, Z-FOLD, GREEN GRID | | |
| A19MP1T | 1251-1895 | 4 | CONNECTOR:5 FEMALE CONTACT | 28480 | 1251-1895 |
| A19MP18 | 1251-1895 | | CONNECTOR:5 FEMALE CONTACT | 28480 | 1251-1895 |
| A19MP19 | 1251-1895 | | CONNECTOR:5 FEMALE CONTACT | 28480 | 1251-1895 |
| A19MP20 | 1251-1895 | | CONNECTOR:5 FEMALE CONTACT | 28480 | 1251-1895 |
| A19MP21 | 1251-1944 | 4 | CONNECTOR:HEXAGONAL 10 MALE CONTACT | 28480 | 1251-1944 |
| A19MP22 | 1251-1944 | | CONNECTOR:HEXAGONAL 10 MALE CONTACT | 28480 | 1251-1944 |
| A19MP23 | 1251-1944 | | CONNECTOR:HEXAGONAL 10 MALE CONTACT | 28480 | 1251-1944 |
| A19MP24 | 1251-1944 | | CONNECTOR:HEXAGONAL 10 MALE CONTACT | 28480 | 1251-1944 |
| | | | | 28480 | 0TT54-60350 |
| A20 | 0T754-60350 | | MARKER(FIGURE 6-19) EXTRA OPTION 015. SAME AS A15,EXCEPT PREFIX A20 | 28480 | 07754-60350 |
| | | | | 28480 | 07754-60350 |
| | 2200-0105 | 2 | SCREW:PAN NO POZI DR 4-40 X 0.312" LG | 00000 | 080 |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| | 07754-60600 | | RACK MOUNT KIT (OPTION 001) | | |
| | 1490-0879 | 4 | SLIDE | 28480 | 1490-0879 |
| | 2510-0123 | 24 | SCREW:FLAT HD POZI DR 8-32 X 0.500" LG | 00000 | 0BD |
| | 01060-00470 | 11 | STRIP NUT | 28480 | 01060-00470 |
| | 07754-00380 | 6 | BRACKET:BACK | 28480 | 07754-00380 |
| | 2680-0051 | 28 | SCREW:PAN HD POZI DR 10-32 X 0.375" LG | 00000 | 0BD |
| | 07754-00400 | 6 | BRACKET:FRONT | 28480 | 07754-00400 |
| | 2680-0051 | | SCREW:PAN HD POZI DR 10-32 X 0.375" LG | 00000 | 0BD |
| | 07754-00640 | 3 | COVER:RECORDER | 28480 | 07754-00640 |
| | 2360-0181 | 16 | SCREW:FLAT HD POZI DR 6-32 X 0.250" LG | 00000 | 0BD |
| | 07754-00670 | 12 | PLATE:NUT | 28480 | 07754-00670 |
| | 07758-00512 | 1 | BRACKET, PAPER TAKEUP | 28480 | 07758-00512 |
| | 07758-20372 | 1 | PANEL, PAPER TAKEUP BRACKET | 28480 | 07758-20372 |
| | 07754-60410 | 1 | ASSY:PAPER TAKEUP | 28480 | 07754-60410 |
| | | | 50 HZ: OPTION 00B<br>ADD THE FOLLOWING FOR OPTION 00B | | |
| | 0160-2554 | 1 | C:FXD PAPER 0.84 UF 6% 220 VACW | 56289 | 153P51-0C5 |
| | 2420-0021 | 2 | SCREW:FLAT HD SLOT DR 8-32 X 0.688" LG | 00000 | 0BD |
| | 2190-0780 | 6 | WASHER:FLAT BLACK FIBER #8 | 00000 | 0BD |
| | 2580-0006 | | NUT:HEX 8-32 THREAD | 78189 | KEP511-081800-00 |
| | 1500-0289 | 1 | SPROCKET:24 TOOTH | 28480 | 1500-0289 |
| | 3140-0398 | 1 | MOTOR:SYNCHRONOUS 375 RPM 115V 50HZ | 28480 | 3140-0398 |
| | 07754-60181 | 1 | REGULATOR/OSCILLATOR BOARD:50 HZ<br>DELETE FOLLOWING FOR OPTION 00B<br>REF. 07754-60250<br>1430-0451 SPROCKET<br>2510-0121 SCREW<br>3140-0337 MOTOR<br>07754-60180 OSC. REG. | 28480 | 07754-60181 |
| | | | MOUNTED IN 10648 MOBILE CART<br>OPTION 054 | | |
| | 1490-0879 | 1 | SLIDE | 28480 | 1490-0879 |
| | 0590-0199 | 4 | NUT:EXT LOCK 84-40 | 00000 | 0BD |
| | 2200-0107 | 4 | SCREW:POZI DR 4-40 X 3/8 W/LOCK | 00000 | 0BD |
| | 2680-0055 | 3 | SCREW:SST PAN HD POZI DR 10-32 X 0.500" | 00000 | 0BD |
| | 1490-0960 | 1 | SLIDES:CHASSIS 17.0" LONG | 28480 | 1490-0960 |
| | 2190-0702 | 12 | WASHER:SHOULDER 0.500" OD 0.200" ID | 00000 | 0BD |
| | 2510-0121 | 12 | SCREW:FLAT HD POZI DR 8-32 X 0.375"LG | 00000 | 0BD |
| | 2680-0107 | 12 | SCREW:PAN HD POZI DR 10-32 X 0.750" LG | 00000 | 0BD |
| | 2510-0123 | | SCREW:FLAT HD POZI DR 8-32 X 0.500" LG | 00000 | 0BD |
| | 01064-00041 | 2 | BRACKET | 28480 | 01064-00041 |
| | 2680-0118 | 16 | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | 0BD |
| | 01064-00042 | 1 | BRACKET | 28480 | 01064-00042 |
| | 2680-0118 | | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | 0BD |
| | 01064-00050 | 2 | BRACKET:7 INCH DRAWER | 28480 | 01064-00050 |
| | 2680-0055 | | SCREW:SST PAN HD POZI DR 10-32 X 0.500" | 00000 | 0BD |
| | 07754-00711 | 1 | DIVIDER:DRAWER | 28480 | 07754-00711 |
| | 07810-00090 | 1 | SPRING:DRAWER | 28480 | 07810-00090 |
| | 2480-0006 | 2 | NUT:HEX 6-32 THREAD | 00000 | 0BD |

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*Table 6-1. Replaceable Parts (continued)*

| Reference Designation | HP Part Number | Qty | Description | Mfr Code | Mfr Part Number |
|---|---|---|---|---|---|
| | 2360-0115 | 4 | SCREW:PAN HD POZI 6-32 X 5/16 W/LK | 00000 | 080 |
| | 07810-60202 | 1 | DRAWER:7 INCH | 28480 | 07810-60202 |
| | 2360-0117 | 2 | SCREW:PAN HD POZI 6-32 X 3/8 W/LK | 00000 | 080 |
| | 0590-0499 | 4 | NUT:ACORN BRASS 6-32 THREAD | 00000 | 080 |
| | 2680-0051 | 6 | SCREW:PAN HD POZI DR 10-32 X 0.375" LG | 00000 | 080 |
| | 2740-0003 | 2 | NUT:HEX STL 10-32 X 3/8 | 78189 | 510-101810-51 |
| | 0362-0155 | 2 | TERMINATION:CRIMP LUG FOR #10 SCREW | 00000 | 080 |
| | 8160-0018 | 2 | BRAID:COPPER WIRE (22") | 70903 | 8660 |
| | 2190-0012 | 1 | WASHER:LOCK PH BRZ #10 | 00000 | 080 |
| | 07810-60130 | 2 | GROUND WIRE | 28480 | 07810-60130 |
| | 2360-0115 | | SCREW:PAN HD POZI 6-32 X 5/16 W/LK | 00000 | 080 |
| | 08824-00041 | 1 | BLANK PANEL | 28480 | 08824-00041 |
| | 2190-0702 | | WASHER:SHOULDER 0.500" OD 0.200" ID | 00000 | 080 |
| | 2680-0107 | | SCREW:PAN HD POZI DR 10-32 X 0.750" LG | 00000 | 080 |
| | 0590-0804 | 20 | NUT:SHEET METAL 10-32 X 0.550" LG | 78553 | C-31758-10-32-24 |
| | | | BENCH-TOP ENCLOSURE(STANDARD SYSTEM) | | |
| | 07754-60261 | 1 | CASE | 28480 | 07754-60261 |
| | 2190-0702 | | WASHER:SHOULDER 0.500" OD 0.200" ID | 00000 | 080 |
| | 2680-0107 | | SCREW:PAN HD POZI DR 10-32 X 0.750" LG | 00000 | 080 |
| | 5060-0767 | 4 | FOOT ASSY:FM | 28480 | 5060-0767 |
| | 7124-2010 | 2 | INSERT:NAMEPLATE | 28480 | 7124-2010 |
| | 07754-00242 | 1 | SHIPPING BRACKET, RIGHT | 28480 | 07754-00242 |
| | 07754-00241 | 1 | SHIPPING BRACKET:LEFT | 28480 | 07754-00241 |
| | 2680-0051 | | SCREW:PAN HD POZI DR 10-32 X 0.375" LG | 00000 | 080 |
| | 07754-00511 | 1 | BRACE:FRONT | 28480 | 07754-00511 |
| | 07754-00491 | 1 | COVER:UPPER | 28480 | 07754-00491 |
| | 2680-0118 | | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | 080 |
| | 07754-00512 | 1 | BRACE:FRONT | 28480 | 07754-00512 |
| | 2680-0118 | | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | 080 |
| | 07754-00521 | 1 | BRACE:BACK | 28480 | 07754-00521 |
| | 2680-0118 | | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | 080 |
| | 07754-00522 | 1 | BRACE:BACK | 28480 | 07754-00522 |
| | 2680-0118 | | SCREW:FLAT HD POZI DR 10-32 X 0.500" LG | 00000 | 080 |
| | 07754-00561 | 2 | TRIM STRIP | 28480 | 07754-00561 |
| | 2360-0181 | 4 | SCREW:FLAT HD POZI DR 6-32 X 0.250" LG | 00000 | 080 |
| | 07754-00570 | 1 | SPRING | 28480 | 07754-00570 |
| | 2580-0006 | 2 | NUT:HEX 8-32 THREAD | 78189 | KEP511-081800-00 |
| | 2510-0045 | 4 | SCREW:PAN HD POZI DR 8-32 X 0.375" LG | 00000 | 080 |
| | 07754-20670 | 4 | SCREW:SHOULDER | 28480 | 07754-20670 |
| | 07754-20710 | 1 | BLOCK | 28480 | 07754-20710 |
| | 2510-0045 | | SCREW:PAN HD POZI DR 8-32 X 0.375" LG | 00000 | 080 |
| | 07754-60410 | 1 | ASSY:PAPER-TAKE-UP | 28480 | 07754-60410 |
| | 07754-60291 | 1 | ASSY:BOTTOM | 28480 | 07754-60291 |

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*Table 6-2. Code List of Manufacturers*

| CODE | MANUFACTURER NAME | ADDRESS |
|---|---|---|
| 00000 | U.S.A. COMMON | ANY SUPPLIER OF U.S.A. |
| 00779 | AMP INC.(AIRCRAFT MARINE PROD.) | HARRISBURG, PA. |
| 01121 | ALLEN BRADLEY CO. | MILWAUKEE, WIS. |
| 01295 | TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV. | DALLAS, TEX. |
| 02660 | AMPHENOL CORP. | BROADVIEW, ILL. |
| 04713 | MOTOROLA SEMICONDUCTOR PROD.INC. | PHOENIX, ARIZ. |
| 05245 | COMPONENTS CORP. | CHICAGO, ILL. |
| 07263 | FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV. | MOUNTAIN VIEW, CALIF. |
| 07829 | BODINE ELECTRIC CO. | CHICAGO, ILL. |
| 08664 | BRISTOL CO. THE | WATERBURY, CONN. |
| 09922 | BURNDY CORP. | NORWALK, CONN. |
| 13103 | THERMALLOY CO. | DALLAS, TEX. |
| 14655 | CORNELL DUBLIER ELECT. DIV.FEDERAL PACIFIC ELECT. CO. | NEWARK, N.J. |
| 18583 | CURTIS INSTRUMENTS INC. | MT. KISCO, N.Y. |
| 19701 | ELECTRA/MIDLAND CORP. | MINERAL WELLS, TEX. |
| 21335 | FAFNIR BEARING CO. THE DIV. TEXTRON INC. | NEW BRITAIN, CONN. |
| 28480 | HEWLETT-PACKARD COMPANY | PALO ALTO, CALIF. |
| 56289 | SPRAGUE ELECTRIC CO. | N. ADAMS, MASS. |
| 70276 | ALLEN MFG. CO. | HARTFORD, CONN. |
| 70903 | BELDEN CORP. | CHICAGO, ILL. |
| 71400 | BUSSMANN MFG. DIV. MC GRAW-EDISON CO. | ST. LOUIS, MO. |
| 71615 | COMMERCIAL PLASTICS CO. | MUNDELEIN, ILL. |
| 71785 | CINCH MFG. CO. DIV TRW INC. | ELK GROVE VILLAGE, ILL. |
| 72135 | ELECTRO MOTIVE MFG. CO. INC. | WILLIMANTIC, CONN. |
| 73734 | FEDERAL SCREW PROD. INC. | CHICAGO, ILL. |
| 75915 | LITTELFUSE INC. | DES PLAINES, ILL. |
| 76530 | CINCH MONADNOCK MILLS DIV. TRW INC. | CITY OF INDUSTRY, CALIF. |
| 76854 | OAK MFG. CO. DIV. OAK ELECTRO/NETICS CORP. | CRYSTAL LAKE, ILL. |
| 77342 | AMERICAN MACHINE & FOUNDRY CO. POTTER & BRUMFIELD DIV. | PRINCETON, IND. |
| 78189 | SHAKEPROOF DIV. ILLINOIS TOOL WORKS | ELGIN, ILL. |
| 78277 | SIGMA INSTRUMENT INC. | S. BRAINTREE, MASS. |
| 78553 | TINNERMAN PROD. INC. | CLEVELAND, OHIO |
| 79136 | WALDES KOHINOOR INC. | LONG IS. CITY, N.Y. |
| 80131 | ELECTRONIC INDUSTRIES ASSOCIATION | WASHINGTON D.C. |
| 82142 | AIRCO SPEER ELECT. COMP. | DU BOIS, PA. |
| 82389 | SWITCHCRAFT INC. | CHICAGO, ILL. |
| 83125 | VICTORY ENGINEERING CORP. | SPRINGFIELD, N.J. |
| 91506 | AUGAT INC. | ATTLEBORO, MASS. |
| 91662 | ELCO CORP. | WILLOW GROVE, PA. |
| 98410 | ETC INC. | CLEVELAND, OHIO |



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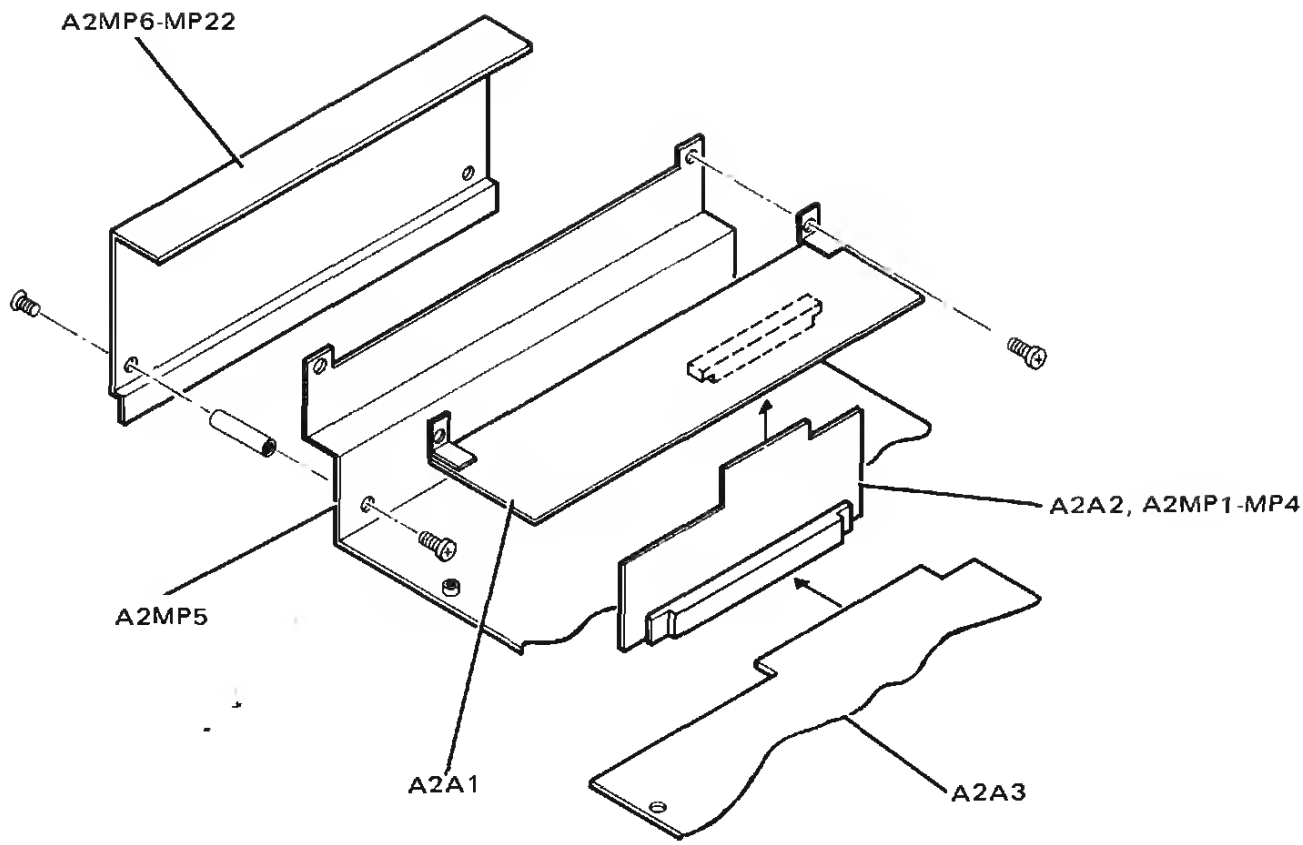


*Figure 6-3. Control Panel A2 (07754-60240) Subassemblies, Parts Location Diagram*

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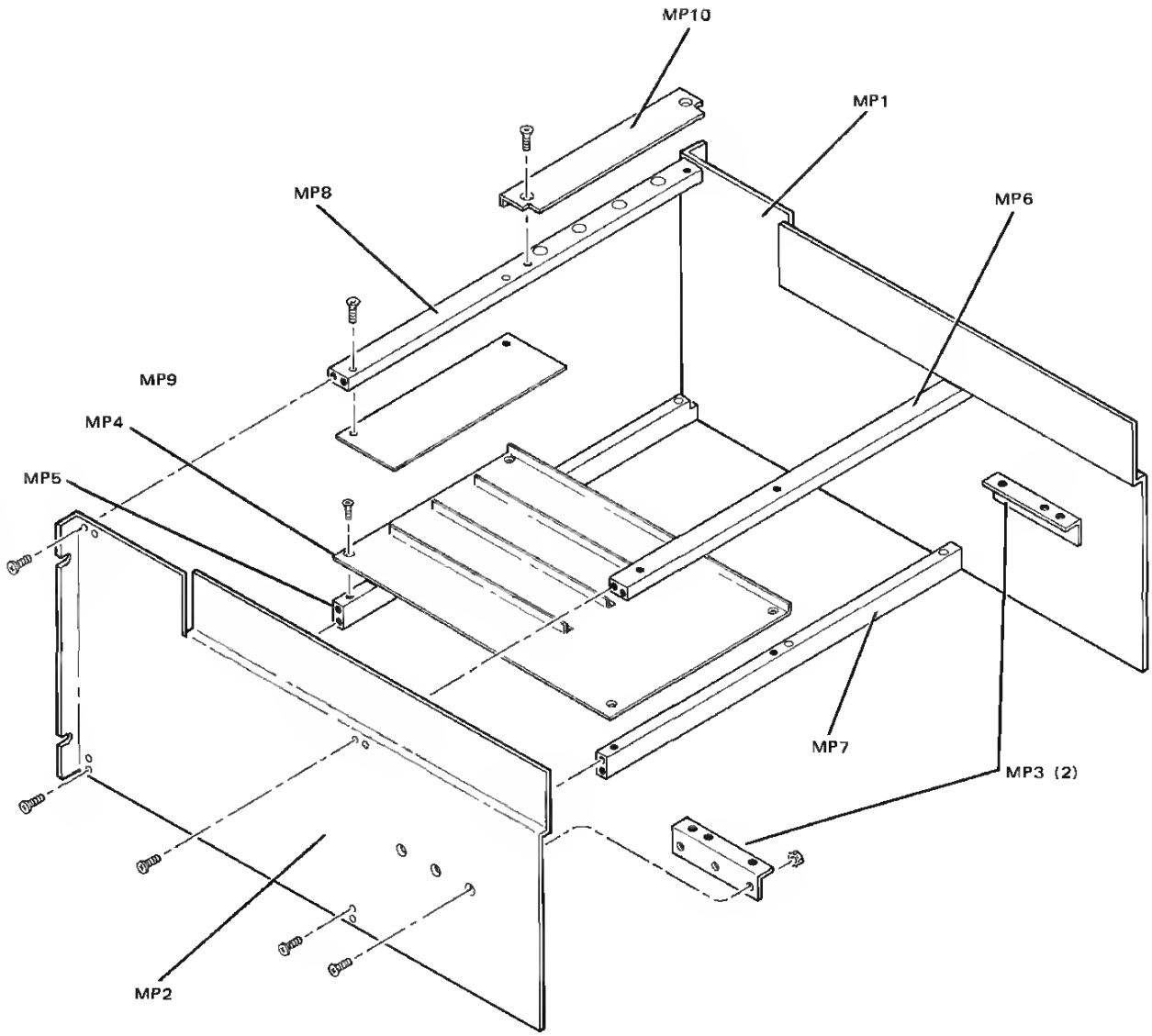


Figure 6-3.

*Figure 6-2. Unit Housing A1 (07754-60270), Parts Location Diagram*

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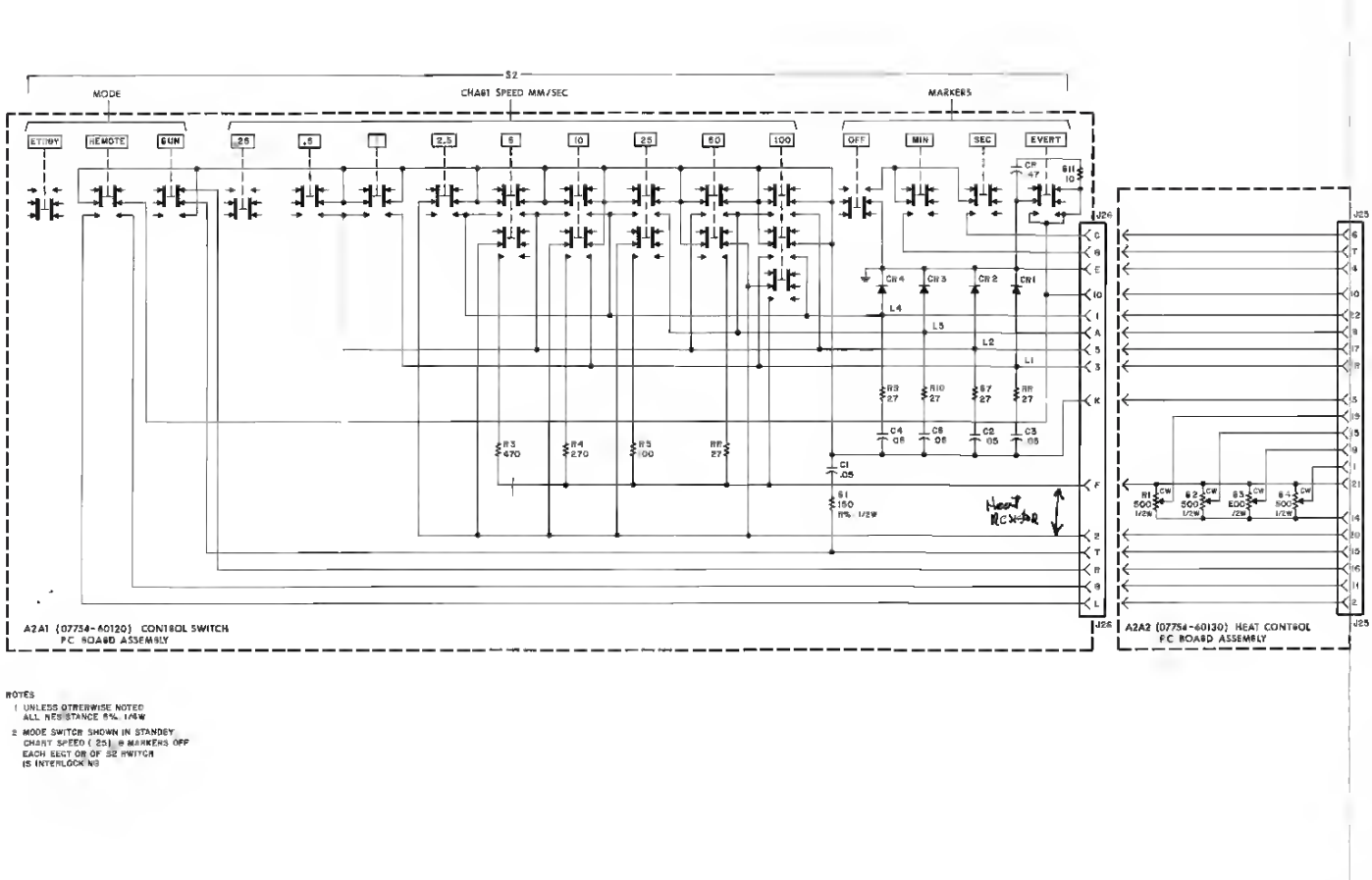


NOTES
1. UNLESS OTHERWISE NOTED ALL RESISTANCE 5%, 1/4W
2. MODE SWITCH SHOWN IN STANDBY, CHART SPEED (.25), & MARKERS OFF. EACH SECT OR OF S2 SWITCH IS INTERLOCKING



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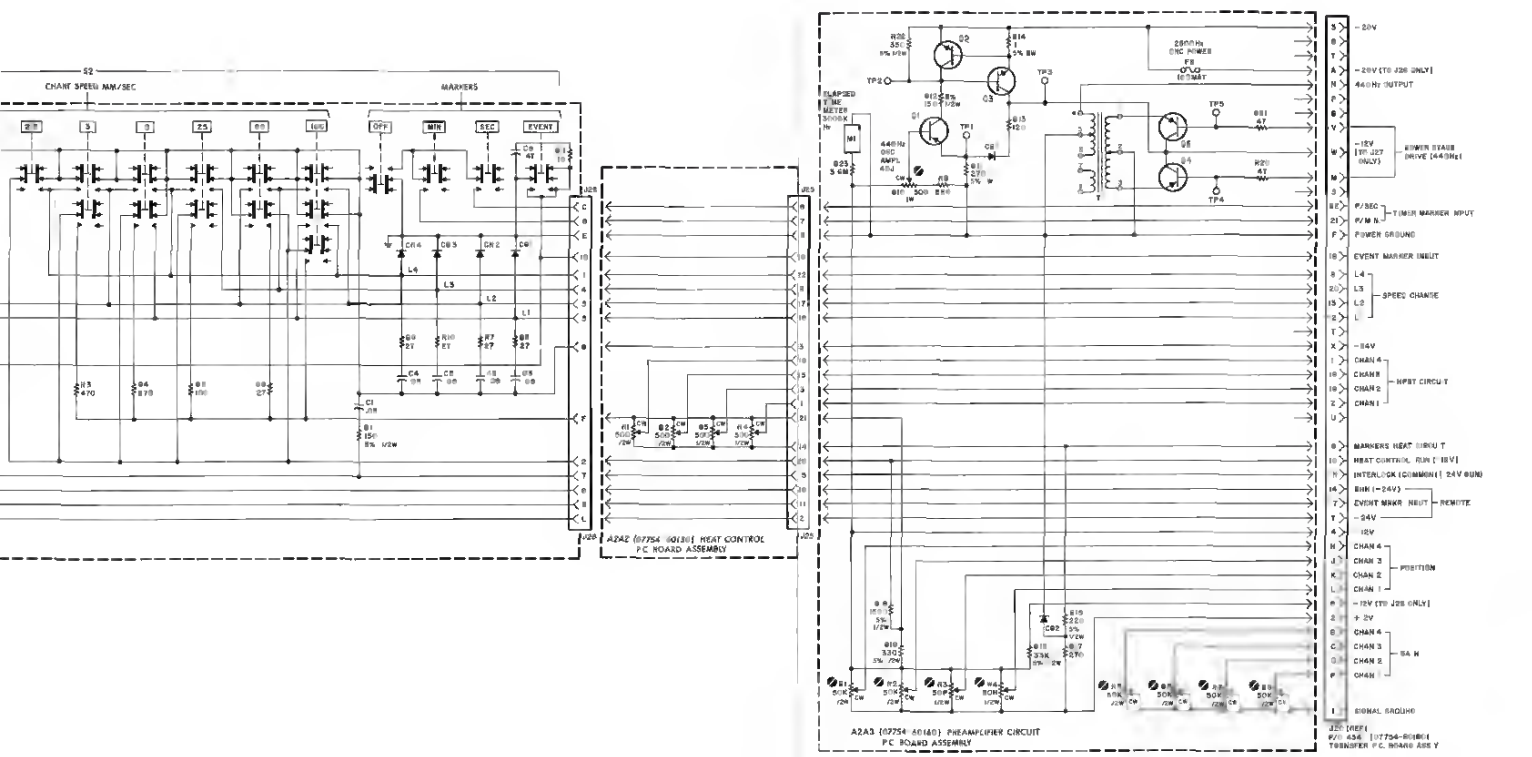


*Figure 6-4. Control Panel A2 Schematic Diagram*



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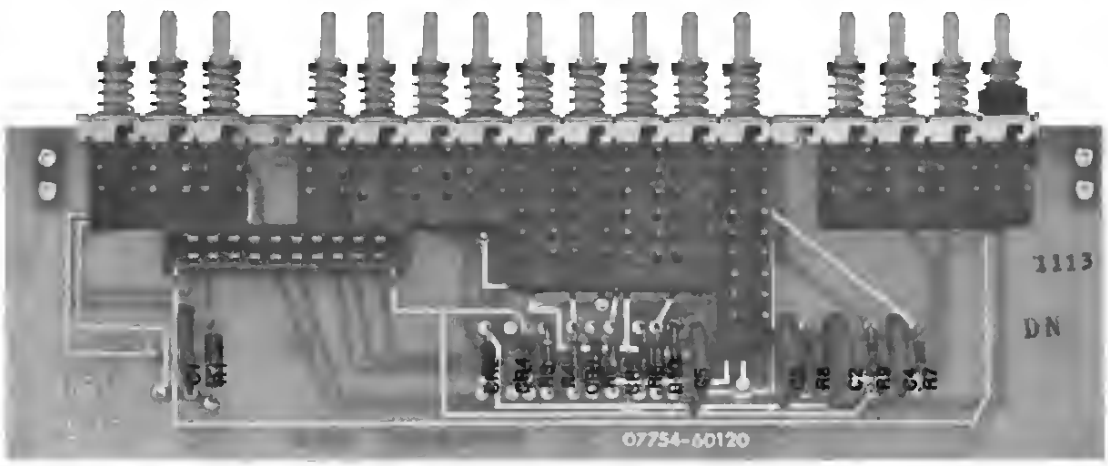
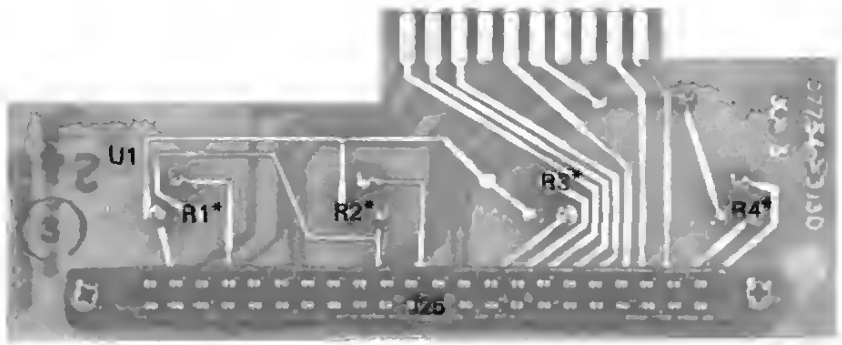



*Figure 6-5. Control Switch Board A2A1 (07754-60120) Component Location Diagram*




POTENTIOMETERS (OTHER SIDE)*

*Figure 6-6. Heat Potentiometer Board A2A2 (07754-60130) Component Location Diagram*



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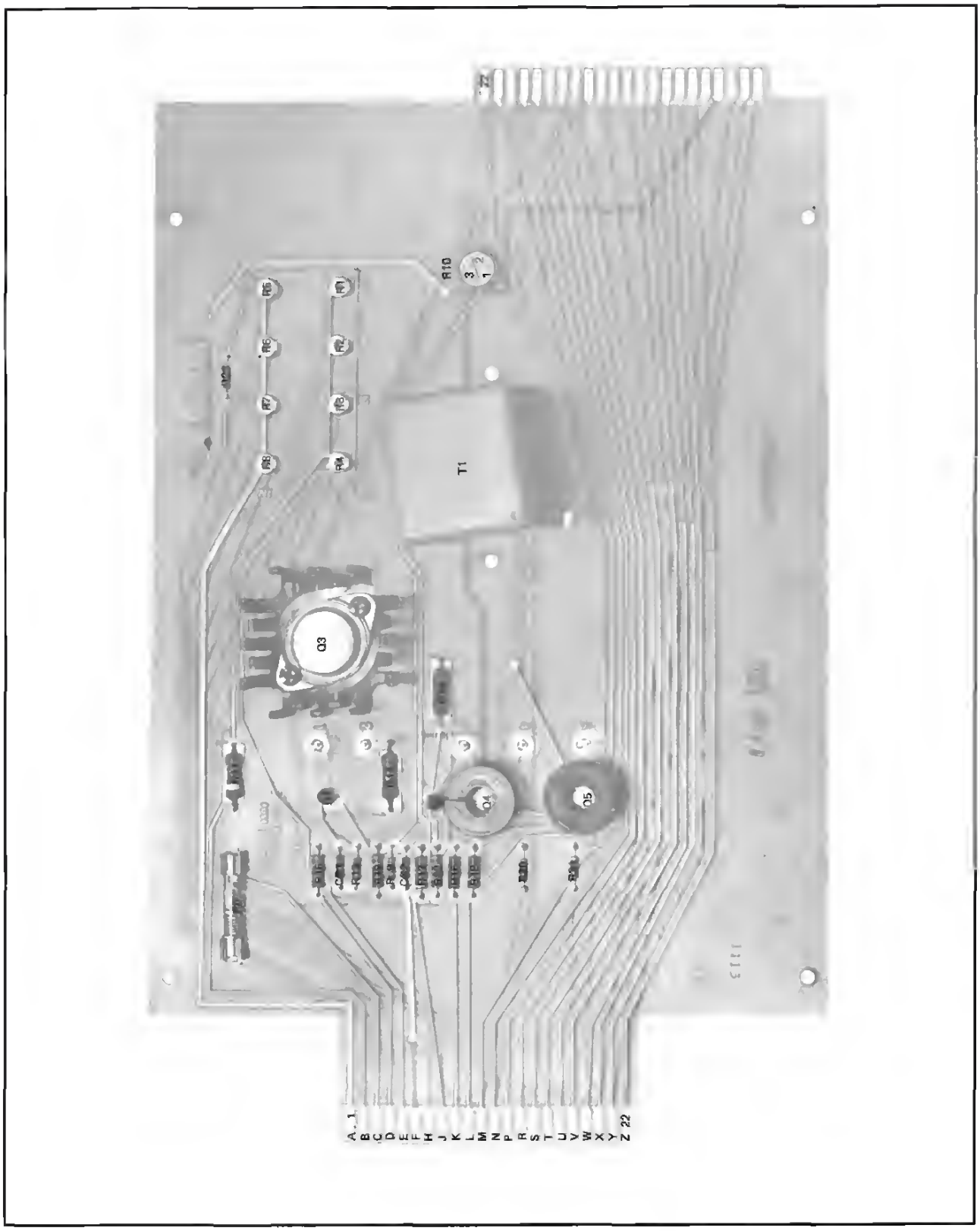


*Figure 6-7. Preamplifier Power Supply Board A2A3 (07754-60140) Component Location Diagram*



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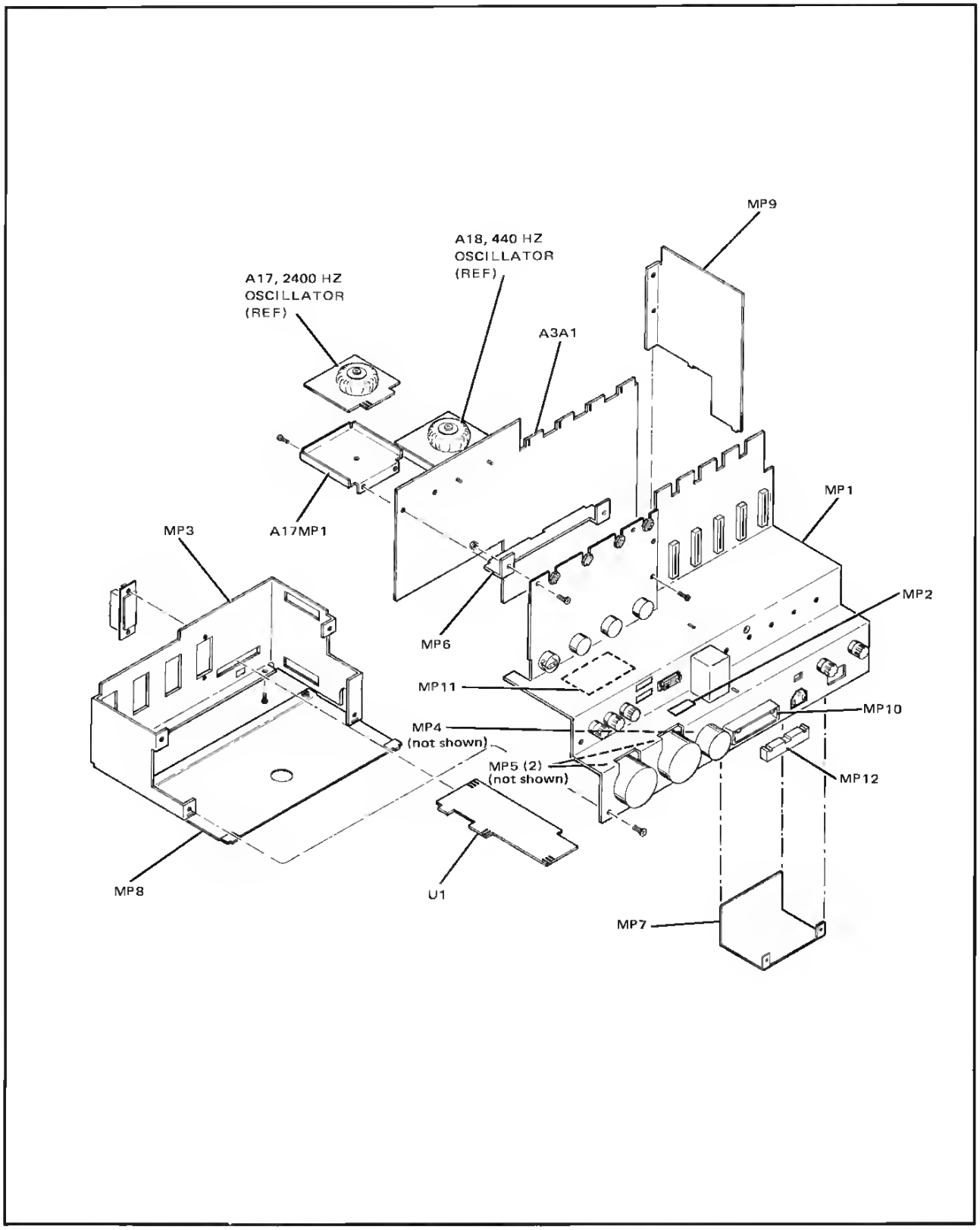


*Figure 6-8. Power Supply A3, Exploded View*



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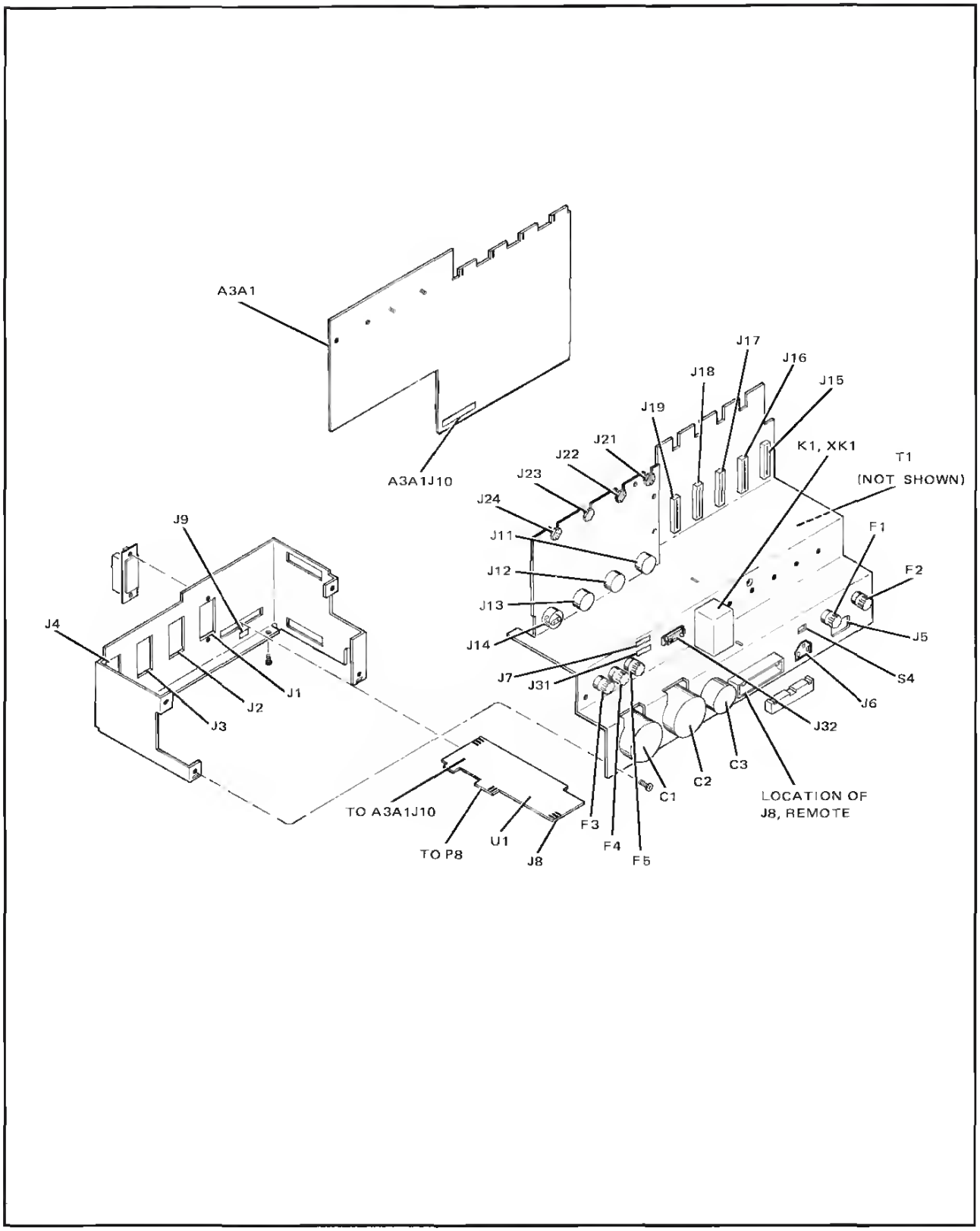


*Figure 6-9 Power Supply A3, Electrical Parts*



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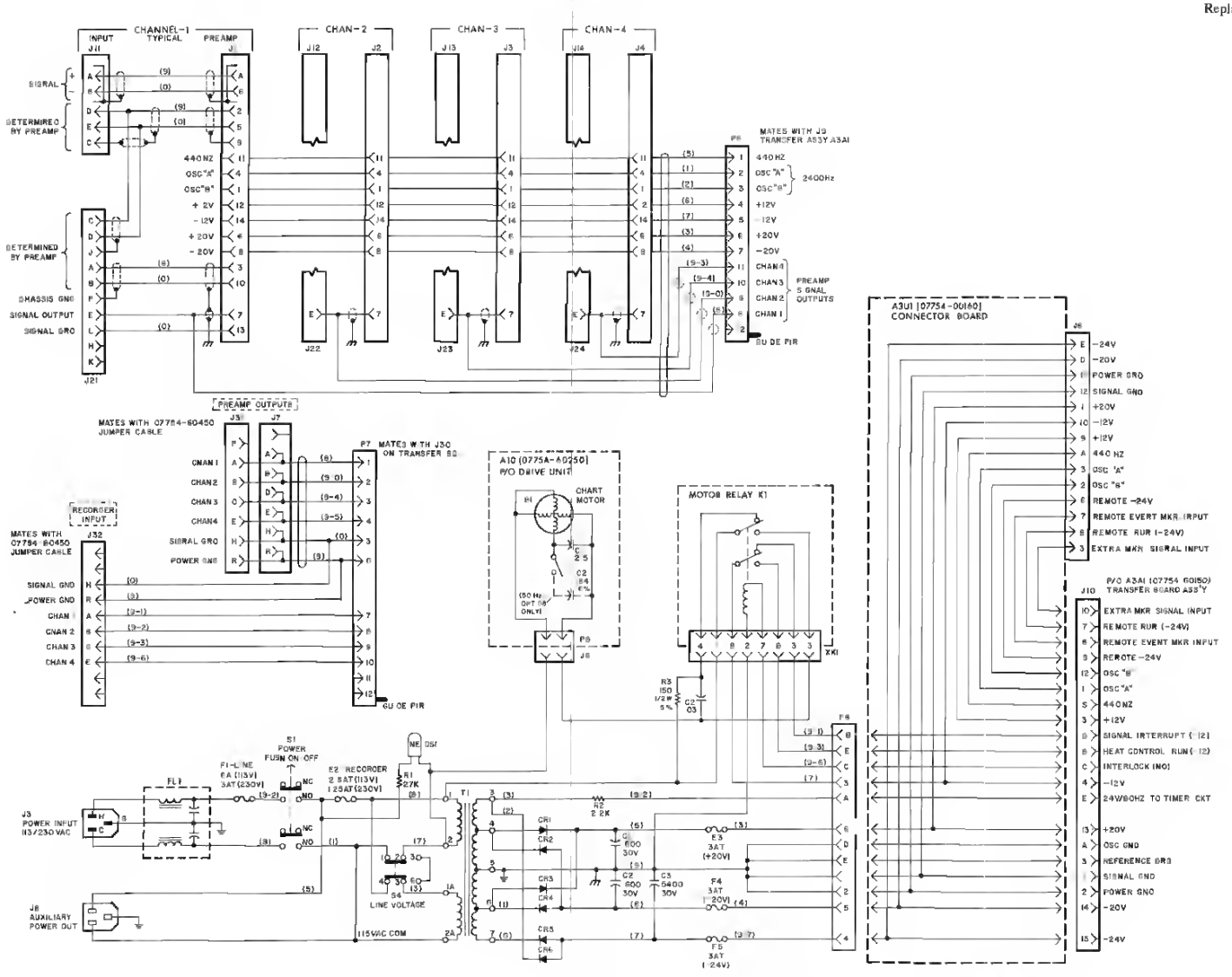


*Figure 6-10 Power Supply A3, Schematic Diagram (Less A3A1)*



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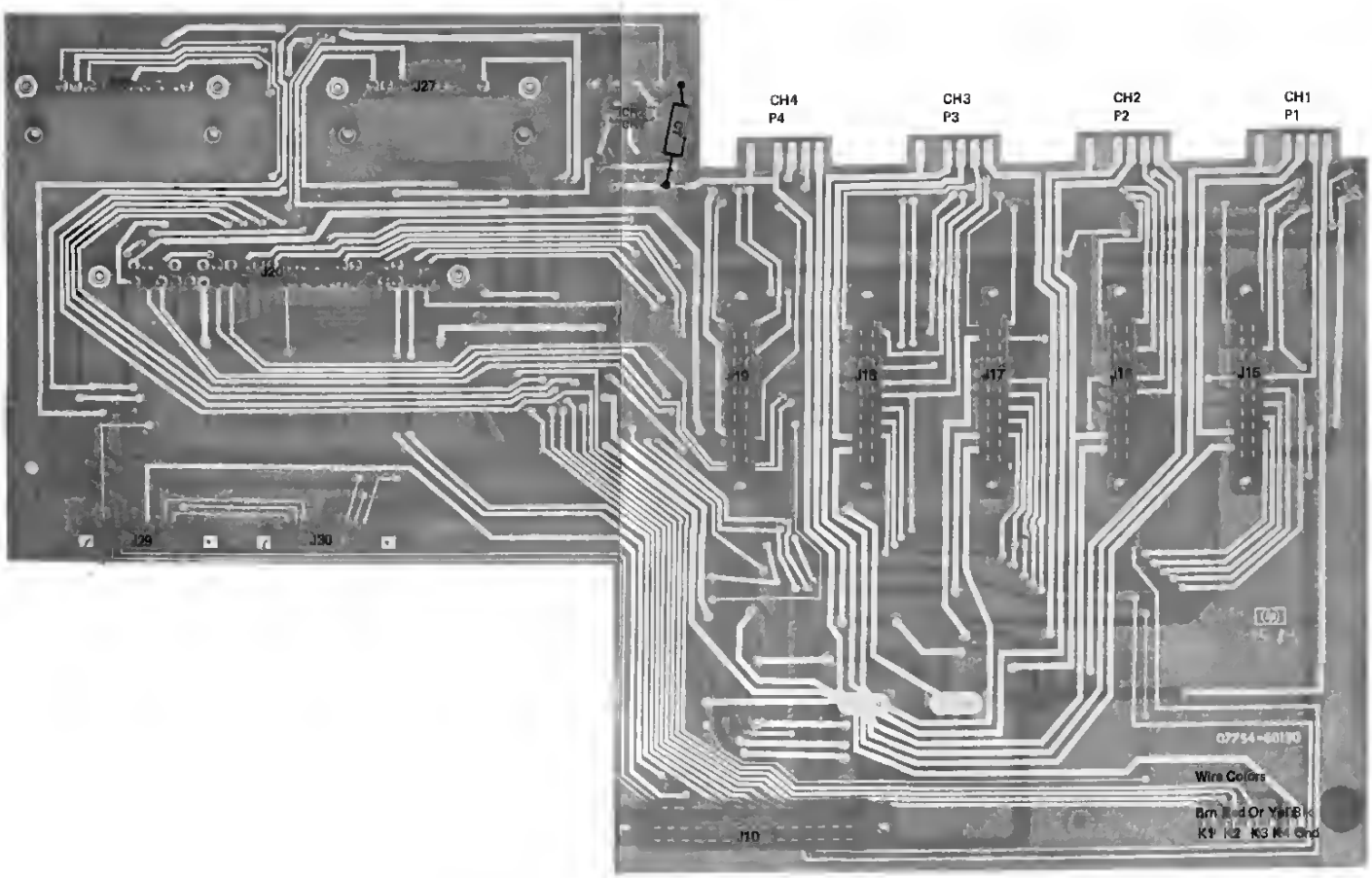


*Figure 6-11. Transfer Board A3A1 (07754-60150) Component Location Diagram*



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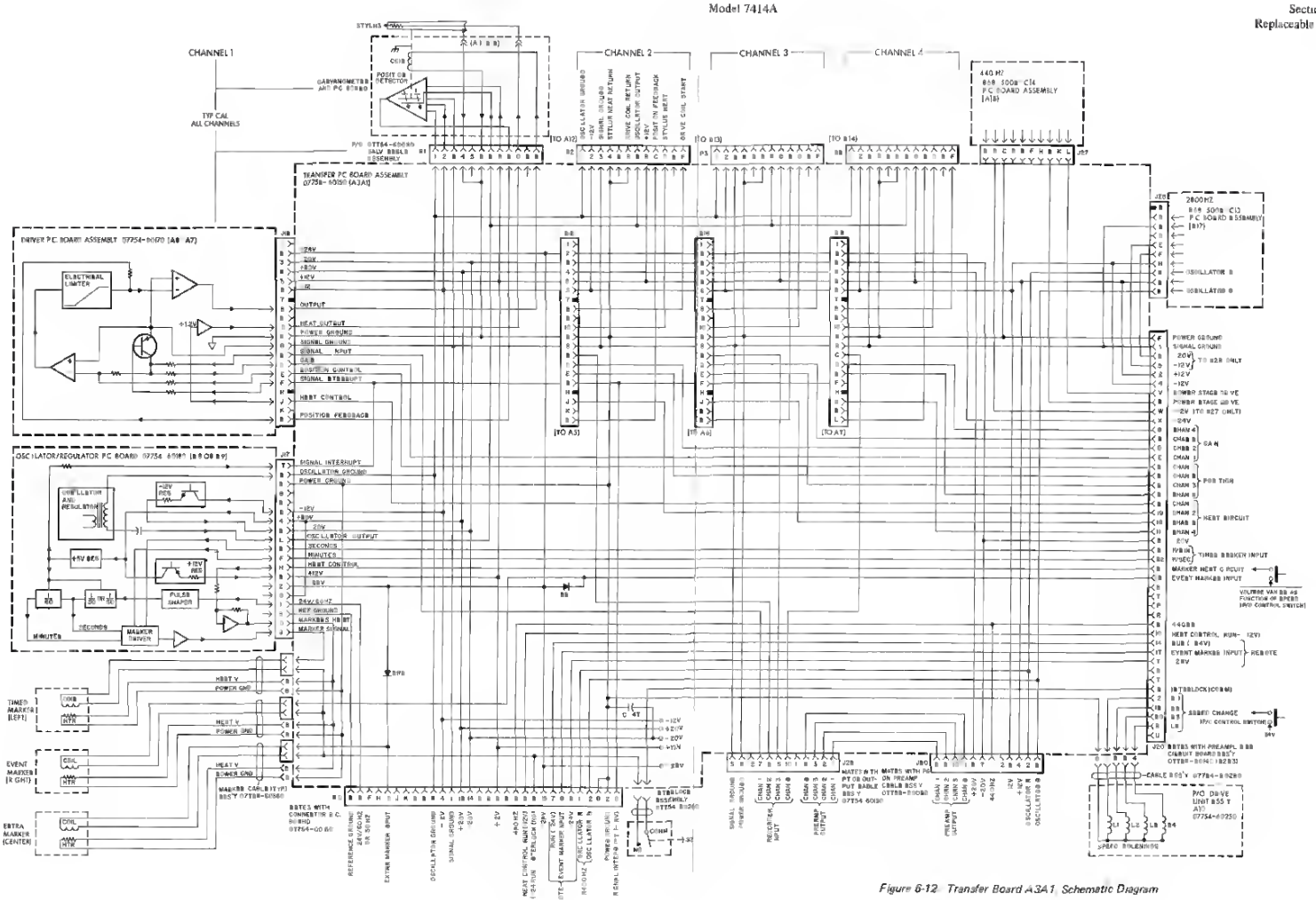


*Figure 6-12. Transfer Board A3A1, Schematic Diagram*



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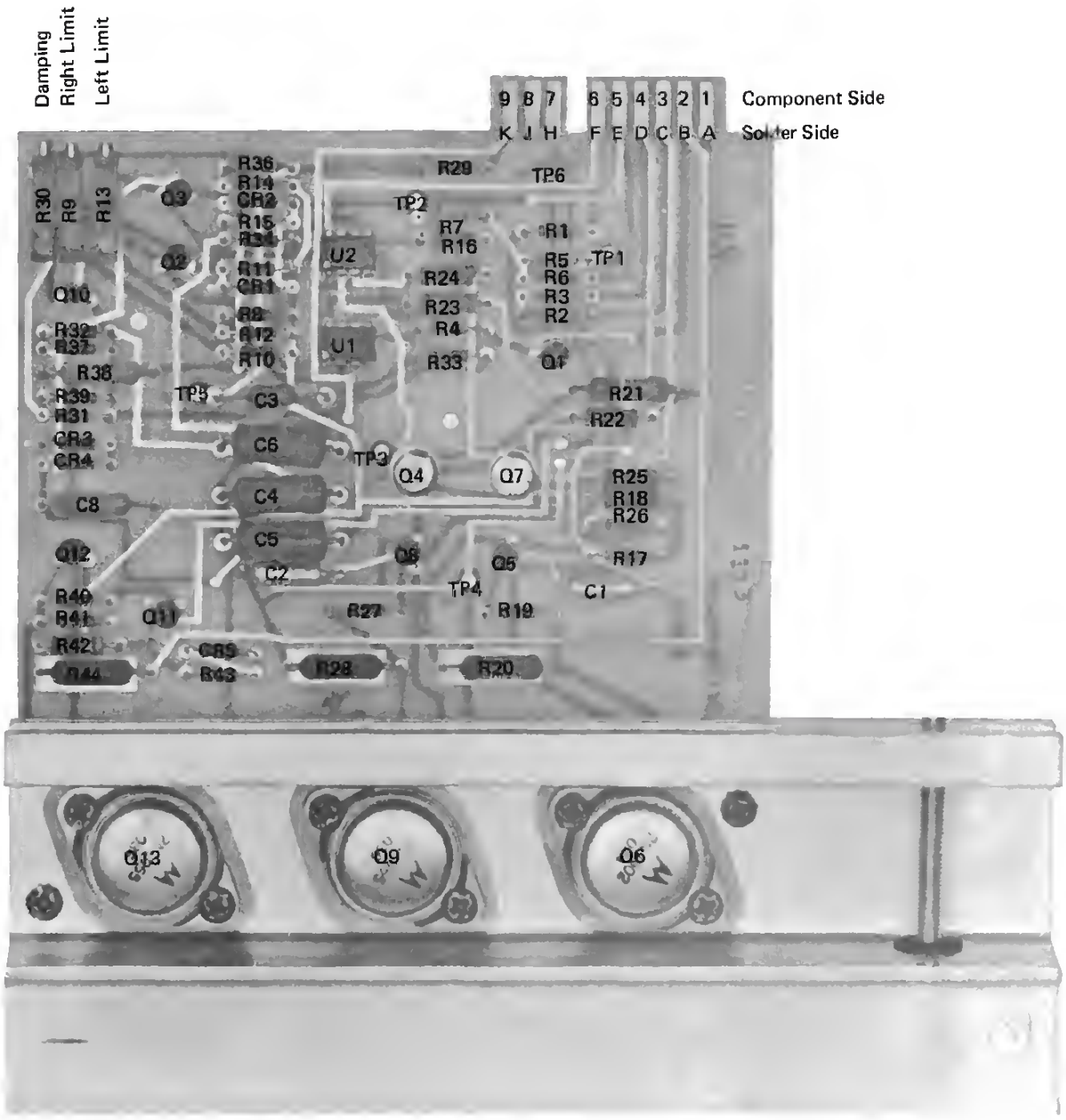


*Figure 6-13. Driver Amplifier A4, A5, A6, A7 (07754-60170) Component Location Diagram*



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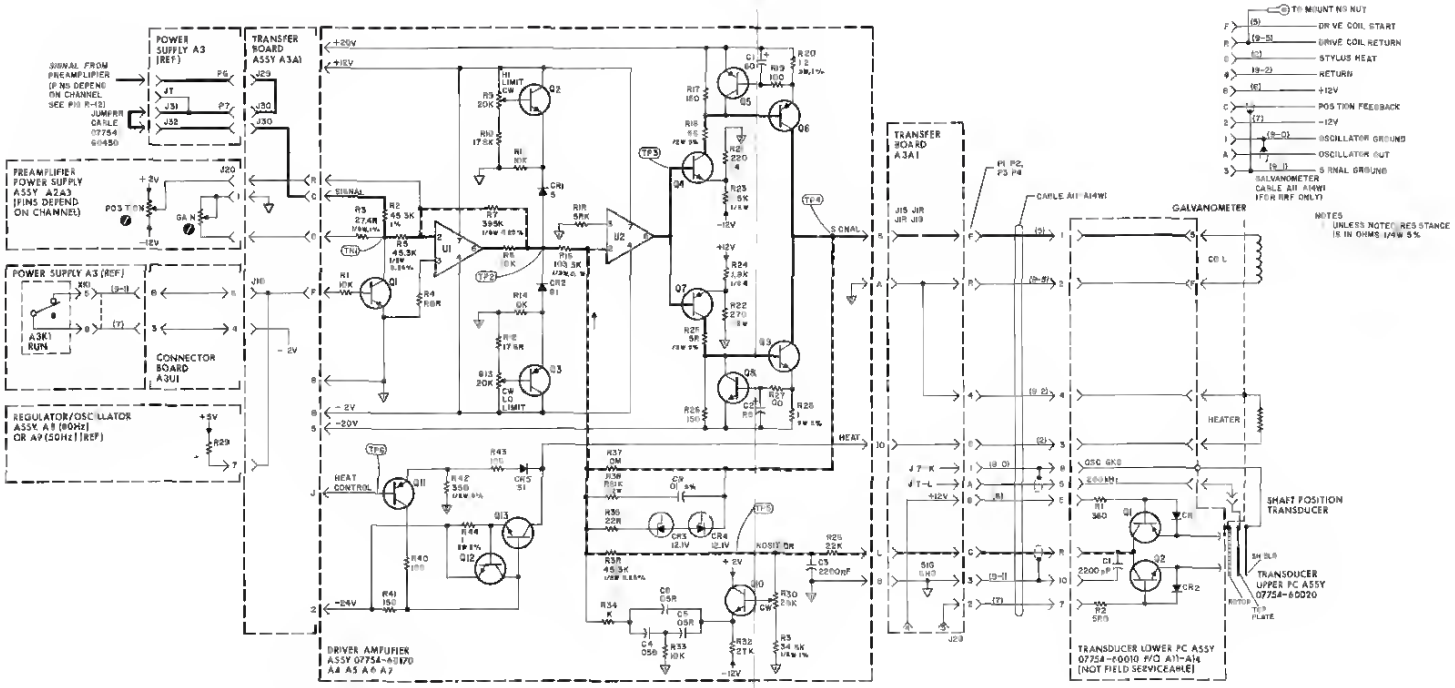


*Figure 6-14 Driver Amplifier A4 A5, A6, A7, Schematic Diagram*



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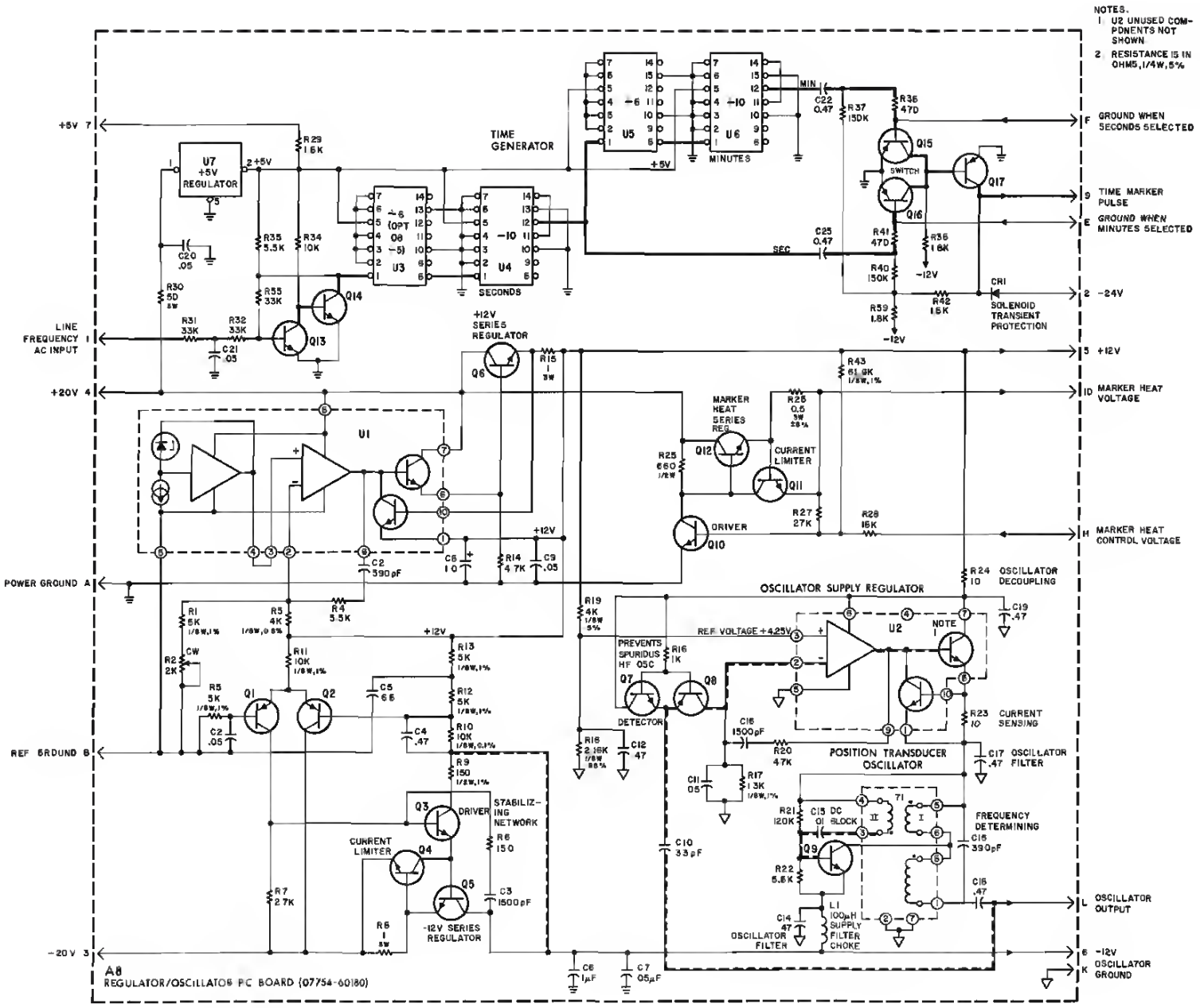


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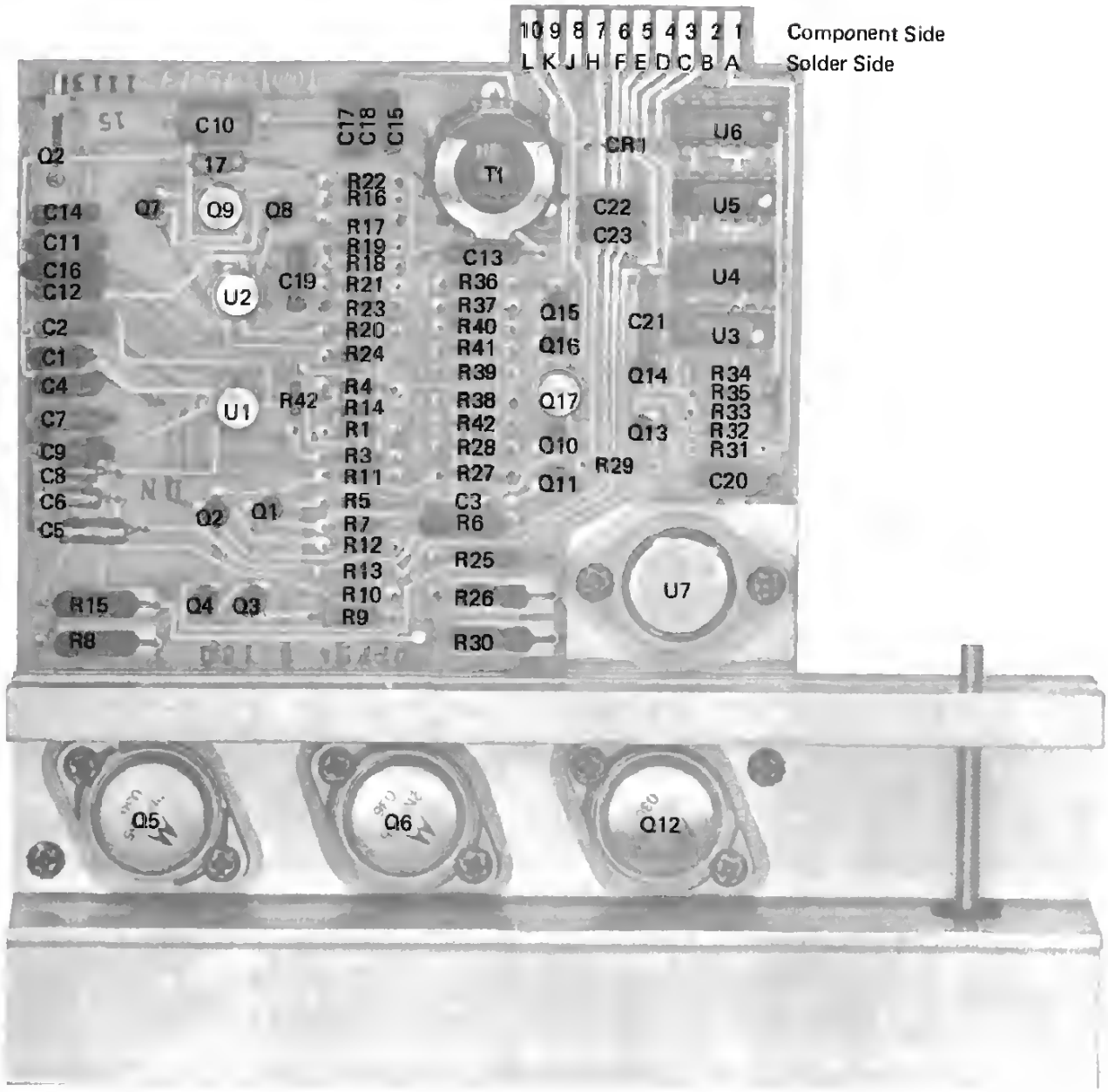


*Figure 6-15. Regulator/Oscillator A8 (60 Hz, 07754-60180) or A9 (50 Hz, 07754-60181) Component Location and Schematic Diagrams*



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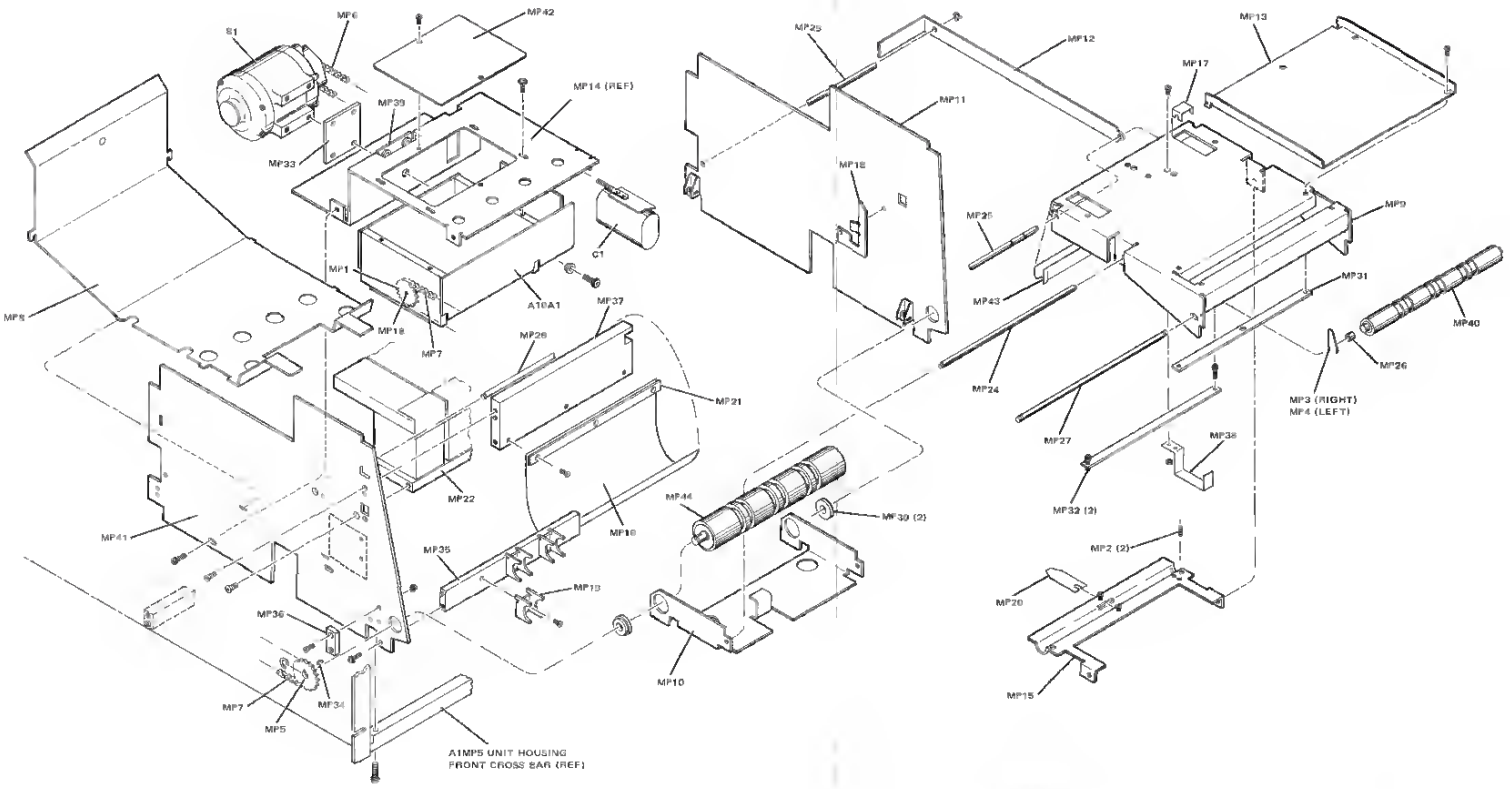


*Figure 6-16. Drive Unit A10 (07754-60250) Subassemblies, Parts Location Diagram*



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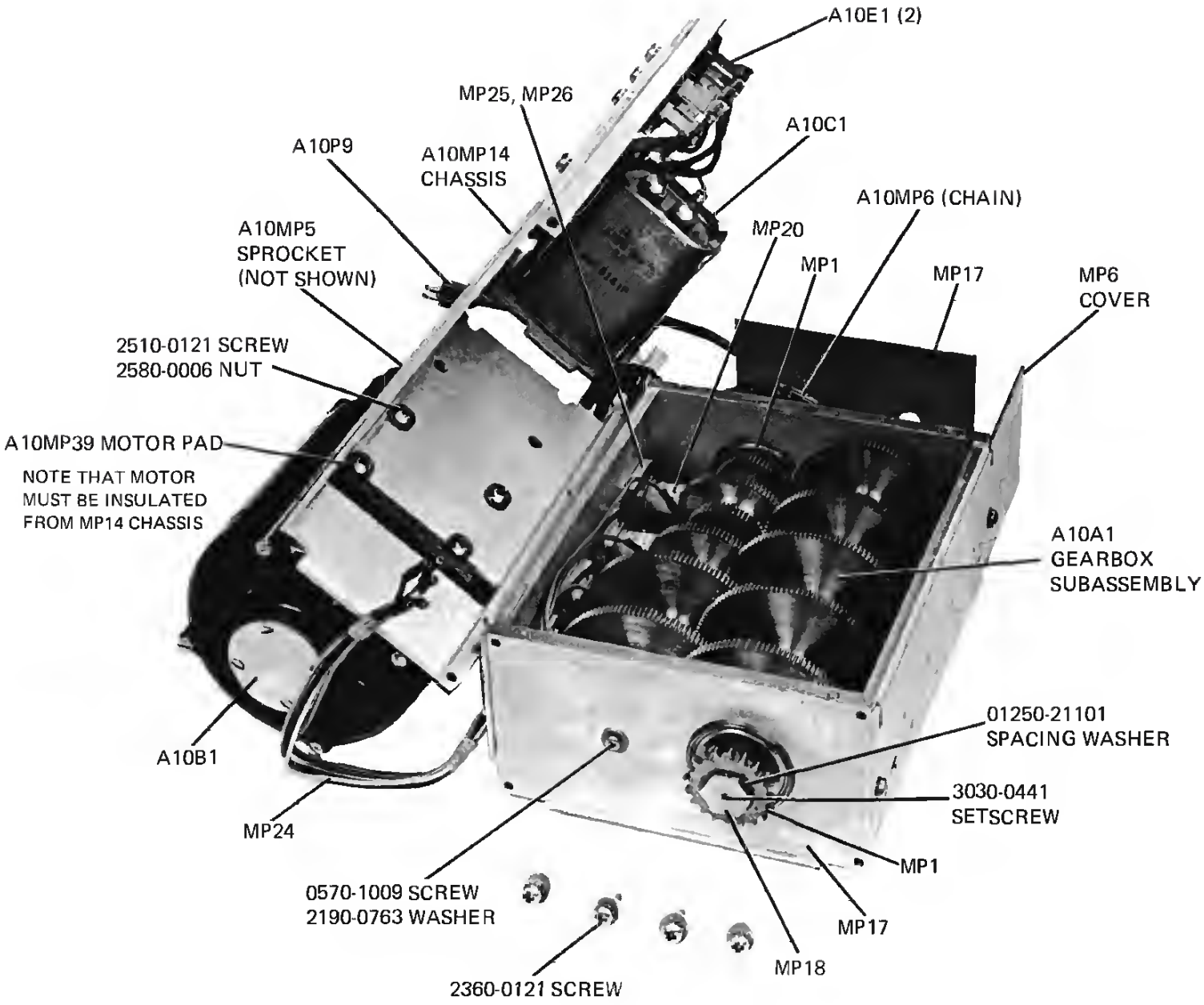


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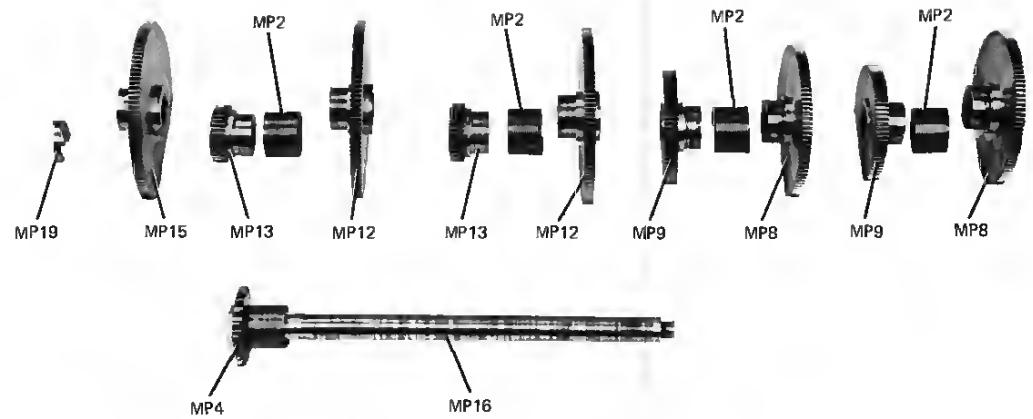


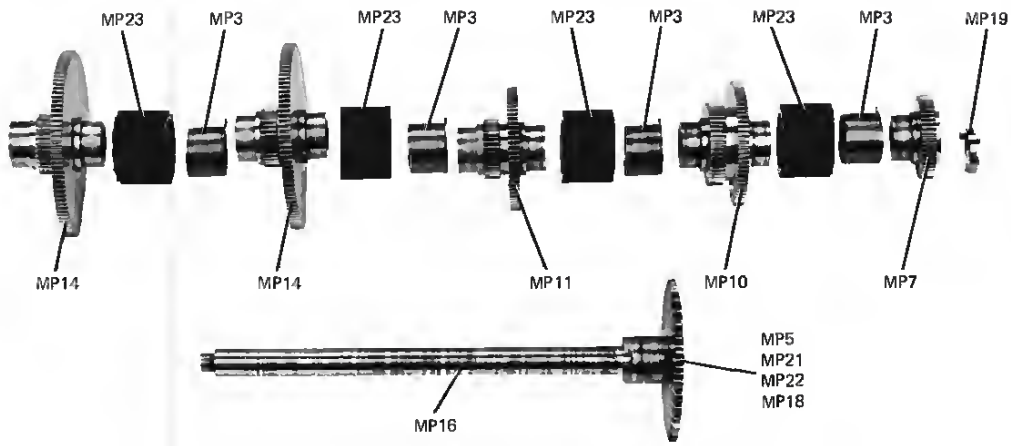


*Figure 6-17 Gearbox A10A1 (07754-60040), Parts Location Diagrams*



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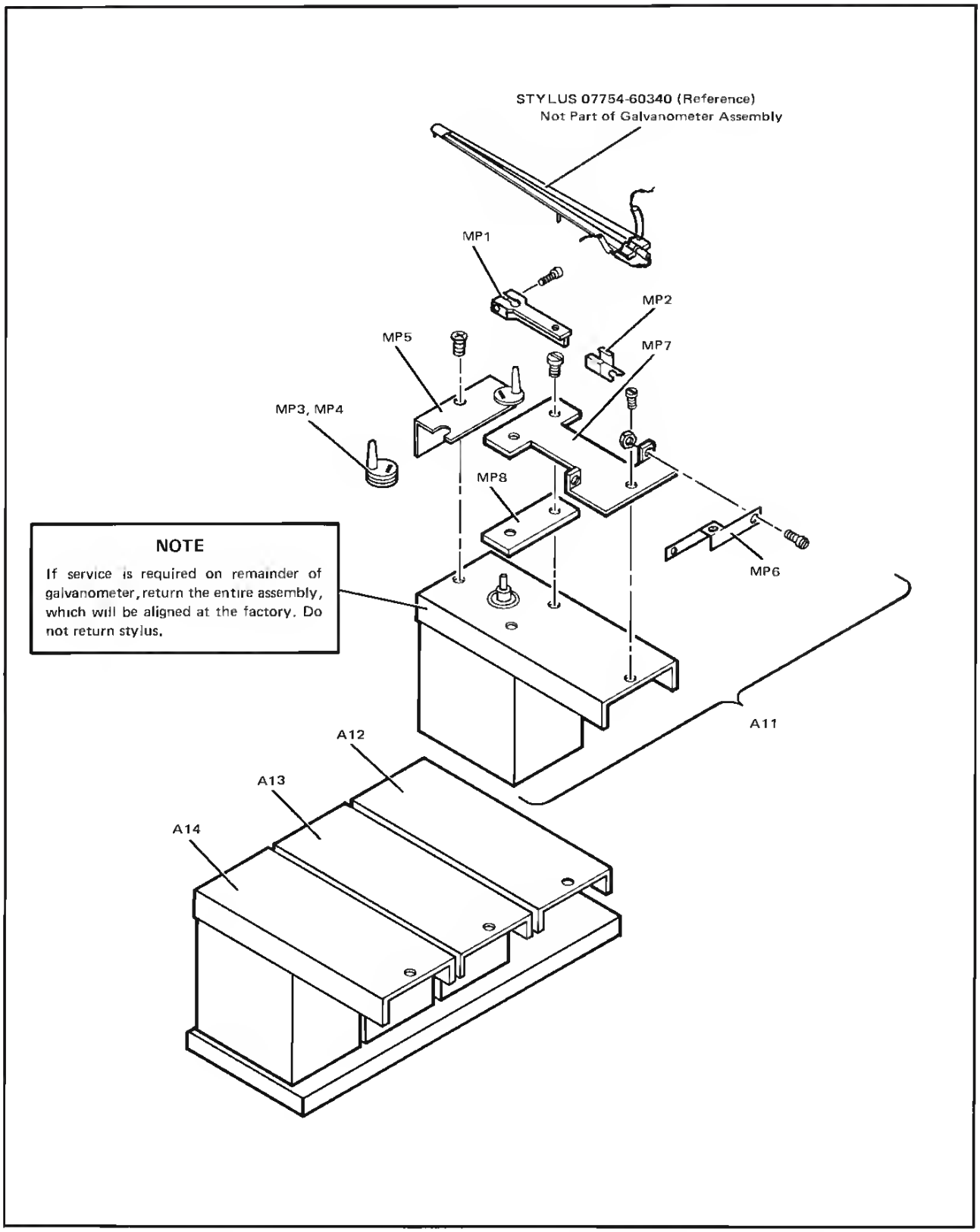


*Figure 6-18. Galvanometer A11, A12, A13, A14 (07754-60070), Parts Location Diagram*



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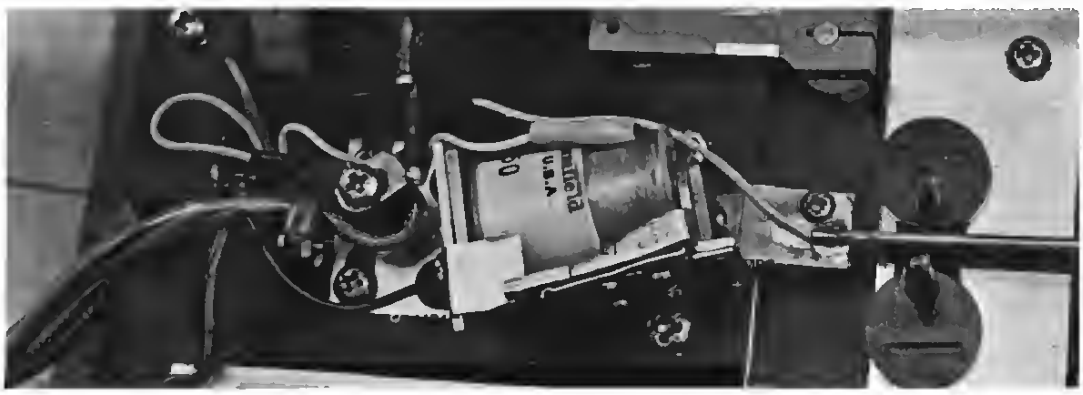
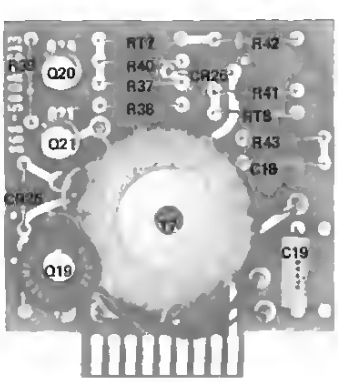


*Figure 6-19. Marker A15, A16 (07754-60350) Component Location Diagram*



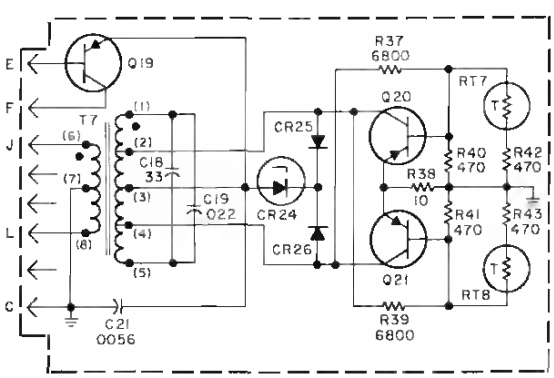




*Figure 6-20. Oscillator, 2400 Hz A17 (868-500AC13)*



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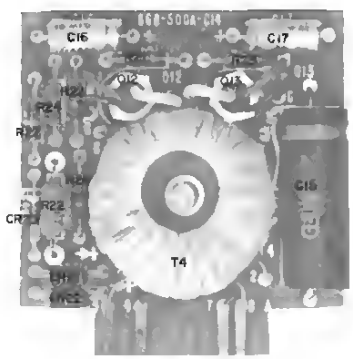


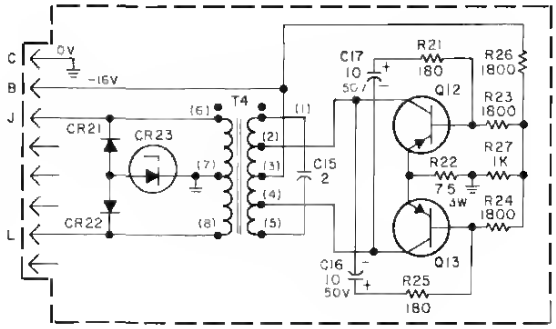


*Figure 6-21. Oscillator, 440 Hz A18 (868-500AC14)*

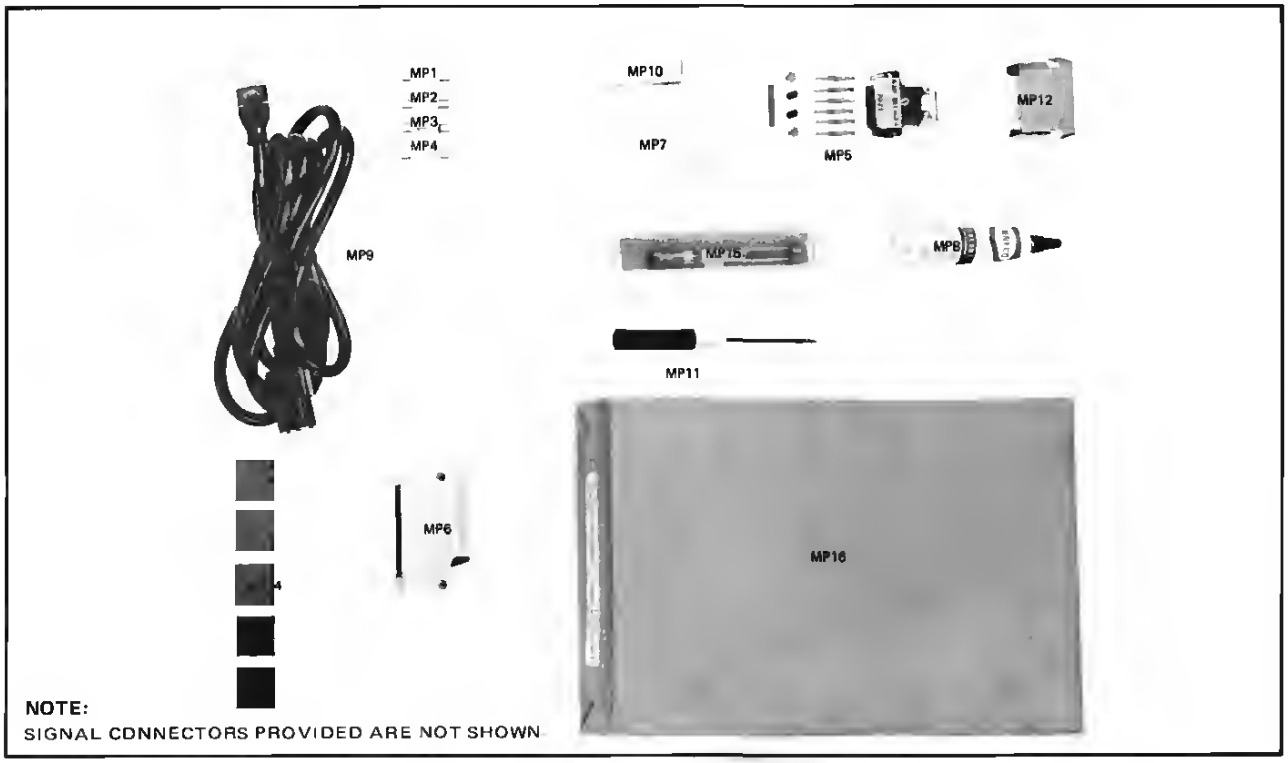


*Figure 6-22. Accessories, A19 (Reference)*



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# APPENDIX I

## BACKDATING INFORMATION

This backdating sheet makes the Operating and Service Manual applicable to instruments with serial prefix numbers lower than 1145A. Check the following table for your instrument serial prefix (first five digits of a ten digit serial number) and make any listed changes in the manual. For instruments with other serial prefix numbers, a MANUAL CHANGES or PUBLICATION CHANGE NOTICE sheet should be included with this manual. If not, the information can be supplied by your nearest Hewlett-Packard Sales and Service office (see list at the rear of this manual).

| SERIAL PREFIX | MAKE MANUAL CHANGES |
|---|---|
| 1145A | NONE |
| 1135A | CHANGE 1 |
| 1113A | CHANGE 1, 2 |
| | |

| SERIAL PREFIX | MAKE MANUAL CHANGES |
|---|---|
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CHANGE 1:

Page 6-4, Table 6-1; A2A1C6 and A2A1R11 were not present.

Page 6-9, Table 6-1; A4U1 and A4U2 were Integrated Circuit 1820-0217.

Page 6-10, Table 6-1; A8T1 was 9100-2353.

Page 6-12, Table 6-1; A9T1 was 9100-2353.

Page 6-14, Table 6-1; (3) 07754-00860 Shim was Quantity (1).

Page 6-20, Figure 6-4; C6 and R11 (A2A1 top right corner) were not present.

CHANGE 2:

Page 6-7, Table 6-1; A3A1C1 was not present.

Page 6-26, Figure 6-11; A3A1C1 was not present.

1-18912-3
1-18803-2
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